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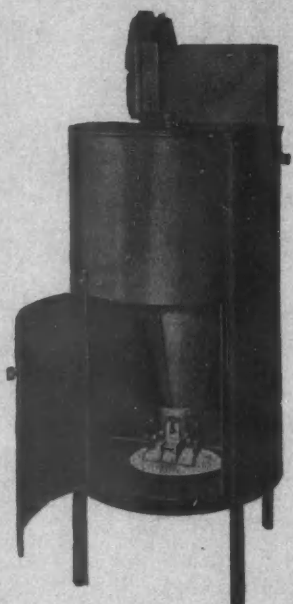
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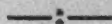
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Some Points of Interest in School Ventilation*

F. M. R. BULMER, M.B., B.Sc. (MED.)

Department of Health, Ontario

THE important factors in ventilation are not at first patent to one who does not give the subject much study. It is fairly well appreciated by everyone that respiration takes something out of the air and expels something into the air. The active gas removed from the air is oxygen and the gas expelled into the air is carbon dioxide. It would seem reasonable to infer from this that the process of breathing in enclosed spaces would so alter the composition of the air as to make it unsuitable for respiratory needs. But this is not so, even in the most crowded and worst ventilated rooms, the variation in the chemical composition of the air having no harmful physiological effects under ordinary conditions. The important point in ventilation is that the physical condition of the air be such that the body can lose its excess heat without undue strain.

The body is continually producing energy from the oxidation of food material and is like an ordinary engine in that it is not a hundred per cent efficient. It is, however, unlike an ordinary engine in that unless the temperature of the body is kept within very small limits serious results will ensue. In order to keep this body temperature constant, the greater bulk of heat obtained from the oxidation of food materials must be dissipated. Excess heat is transferred by the body to the environmental air. Now, on the physical condition of the air depends to a great extent the ease with which this can be done. Thus in ventilation, temperature, air motion and humidity are the prime factors. These combined factors largely influence the heat loss from the body.

*Presented at the Annual Convention of the Ontario Educational Association, Toronto, April, 1929.

FUNDAMENTAL FACTORS

Temperature

Of the three, temperature is the most important. The temperature of environmental air chiefly regulates the methods by which heat is lost from the body. When the temperature is low or medium, that is, 68°F. or lower, heat is lost mainly by conduction, convection and radiation. At higher temperatures, sweating is induced. This sweat is evaporated on the skin, the latent heat being supplied by the body. At high temperatures, then, the body loses heat by evaporation of sweat and by conduction, convection and radiation. At air temperatures the same as body temperature, or higher, heat loss from the body is only possible by evaporation of sweat. It follows then that at air temperatures higher than body temperature, the heat loss due to evaporation of sweat must be equal to the heat produced in the body plus the heat supplied to the body by its hotter atmospheric environment. The body here acts like a refrigerator keeping its temperature lower than the surrounding air.

Air Movement

The effect of air movement on the body is considerable. At low and ordinary temperatures air movement greatly increases heat loss from the body due to convection. At higher temperatures it helps greatly the evaporation of sweat. Thus by increasing the air motion, we can compensate to a great extent increase in temperature. A temperature of 75°F. with a high air velocity might have the same deheating effect as a much lower temperature with a lower velocity. Apart from its deheating effect air motion is very important for its cutaneous or skin stimulation. A variable air motion is always desirable.

Humidity

Much has been said about the humidity of the air. The regulation of the humidity has been advanced by many people as the panacea of all our air conditions. The idea prevails that a low humidity is detrimental to health and, to quote a Chicago school principal who some years ago wrote on the subject, "We are trying to educate children in air three times as dry as that which kills the hardiest cactus God ever permitted to start on the most neglected portion of His footstool." The air in the class room may be as dry as desert air at times, but dry air does not necessarily mean a high rate of drying. Temperature and air motion, as well as humidity, are both important factors in drying. The humidity should be low rather than high. High humidity always causes trouble. When the temperature is high, excessive humidity makes cooling of the body difficult because of its adverse effect on evaporation of sweat. When the temperature is low and the humidity

high, heat loss from the body is increased by conduction, and by the greater heat absorbing properties of moist air over dry air. This is the explanation of the fact that on sultry days the sensation of heat bears no relation to temperature and that on damp days one feels chilly when the temperature is not very low. In short, high humidity greatly decreases the range of temperature in which comfort can be attained.

Air conditions in the class room should be such that the children can lose their excess heat with ease, rather cold than hot.

As a rule the ventilation systems now found in schools are designed primarily to dilute and change the air in the room so many times an hour, according to the size of the room and the number of occupants. No special attention is given to the physical condition of the air in the class room in its relation to heat loss from the body.

SCHOOL ROOM VENTILATION

During the last five years, the Division of Industrial Hygiene of the Ontario Department of Health of Ontario, has made investigations into the atmospheric conditions in factories, office buildings, schools, etc. Our experience has shown us that while school ventilation has been strongly criticized, the actual air condition in the average school room is considerably better than what obtains in other places. The reason that the school room plays such an important part in the ventilation controversy is its suitability for investigation.

Temperatures in school rooms are very often too high. The reason for this condition can be attributed to more than one cause. If mechanical ventilation is used it is necessary to keep the windows closed in order to maintain the system in balance. Thus, assuming that you start in the morning with a temperature of 66°F., the thermostat set to shut the radiators off at 68°F., the temperature of your incoming air at 68°F. or over, and 40 to 50 pupils in the class room, you have the following condition resulting:—There are now three sources of heat, the radiators, the pupils, and the incoming ventilating air. At 68°F., if the thermostat is in good working order, the steam to the radiators is shut off. This does not mean that the radiators become cold at once, but that they are furnished no more steam. They still continue to supply heat to the room for some time while the pupils and ventilating air are a constant source of heat supply. If the heat supplied by the lagging radiators, pupils, and ventilating air is greater than the heat loss from the room to the outside, the temperature must rise. Now the heat loss from any room will vary with the outside weather conditions. If the room is protected from the wind or exposed to the sun, its heat loss will be less than that of rooms not so situated. Thus, it is apparent that two rooms in the same school having the same plan, the same number of pupils and the same treatment in regard

to ventilation and heating, may have a different rate of heat loss if their outside exposure is not the same. One room may present reasonable atmospheric conditions while the other is much too hot or *vice versa*. This is a common reason why some rooms are overheated, especially so during the milder winter weather. Another important contributing cause of high temperature in the room is the heating of the incoming ventilating air to a much higher temperature than the room air. This not only causes an increase in room temperatures, but tends also to make the air about the head much hotter than at foot levels, a condition favoring respiratory infection. Then we have the human factor as a cause of overheating. The teacher, to a great extent, regulates the temperature of the room by her sensations. If she feels too cold she complains bitterly and more heat is supplied, usually by setting the thermostatic heat control at a higher temperature. If the room is too hot that condition is generally accepted as a matter of course. Unfortunately, as far as comfort is concerned, air conditions which suit one individual do not necessarily suit another. There are many people who like it cool and a great many more who enjoy only a tropical temperature. Comfort in regard to heat and cold cannot be used alone as an indication of good atmospheric conditions. Our sense of comfort largely depends on what atmospheric conditions we are accustomed to. People living in overheated homes will demand that their work places be overheated also, and *vice versa*. Therefore the temperature in the school room should not be raised above 68°F. because the teacher feels cold. Instead the teacher should accustom herself to a lower temperature. This is very important, especially so because of the higher metabolic rate in children than in adults. Children produce more heat than adults and in consequence can stand much lower temperatures. Usually also the child is heavily clothed. Another important cause of high temperature is defective thermostatic heat control.

MECHANICAL VS WINDOW VENTILATION

The use of the window as an adjunct to a mechanical system of ventilation, as I have mentioned before, throws out of balance the ventilation system. Nevertheless the use of the window should not be denied to the teacher. The mechanical systems of ventilation installed in schools to-day are not based on the essential factors. Overheating is a common result and the opening of windows is our only alternative at present to combat the situation.

Much has been said of the advantage of window gravity exhaust ventilation (natural ventilation) over the mechanical systems. At the present time there is no doubt in my mind that the physical condition of the air can be regulated better when this natural method is used. By this means each room can be regulated independently of

the other and excessive overheating can be prevented. Variable air motion is also obtained with its stimulating cutaneous effect. On the other hand the trouble with the window method is that the burden of operation is on the teacher and that the teacher's sensations in regard to heat and cold will control largely the air condition. At this point it can be stated again that sensations of comfort should not be taken alone as a satisfactory index of ventilation.

Mechanical ventilation based primarily on the control of the physical condition of the air and not merely air dilution, producing always an atmosphere with proper reheating effect in relation to heat production of the occupants, creating a variable air motion which gives the necessary cutaneous stimulation should, I think, give better results than the ordinary window ventilation in use to-day.

The method of introduction of air into the class room as used to-day must be changed. The present mechanical ventilation equipment produces air movement in the class room of a directional nature, creating local chilling. Mechanical equipment of to-morrow will have to introduce the air into the class room without a directional air velocity and with considerable variability. I might say here that stimulation depends on variety. A steady continuous directional air movement does not produce cutaneous stimulation. Variation is essential.

The removal or masking of odours is an æsthetic rather than a health problem. As a rule, objectionable body odours are in evidence only when excessive sweating is occurring. If proper air conditions are attained odours will be greatly reduced. Odours are always more evident when the humidity is high. This is an additional reason why low rather than high humidity is desirable.

The use of clothes is another factor in ventilation. Clothes afford the wearer a chance to accommodate himself to his own peculiar idiosyncrasies in regard to heat and cold. It is important to remember that the child in the class room is under discipline and cannot accommodate itself to air conditions by changes of clothes, posture, or physical activity, as it can when outside the school. This makes it doubly important that the temperature should never rise above 70°F. A range from 65°-68°F. should be the objective in the class room.

The New Narcotic Act

C. H. L. SHARMAN, C.M.G., C.B.E.

Chief, Narcotic Division, Department of Health, Ottawa

THE Opium and Narcotic Drug Act, having been amended in 1923, 1925 and 1926, and the Department of Health being desirous of still further strengthening its provisions, it was felt that the time had come when the whole Act as it stood, together with the proposed amendments, should be placed before Parliament, in order that an opportunity might be afforded of ascertaining the strength of public opinion as represented through its legislators upon this important subject, particularly as the Act in question is, of necessity, of a very stringent nature.

Another reason for revision was that during 1928 Canada ratified the International Opium Convention of the League of Nations, obligating herself to conform to a rigid system of narcotic licensing, both domestic and in connection with international transactions, and the present afforded a convenient opportunity to give effect to the implied obligation to bring Canadian legislation in regard to narcotics up to the highest standard.

We have, therefore, now, as the law of the land, an enactment which it is felt represents up-to-date public opinion, and which, being in one piece rather than the original Act with a number of amendments thereto, will be in more convenient form, and afford better opportunities of studying its provisions.

The basic principle kept in mind in drafting this legislation was that while every possible provision should be made for combating the activities of the illicit traffic, efforts should be made to remove any small obstacles to the reasonable use or supplying of narcotics to or by physicians, druggists, etc. Consultations were held with the officers, legal and otherwise, of the Canadian Pharmaceutical Association, and others, while as eight of the ten members of the special committee of the House of Commons to which the bill was referred were physicians, a good opportunity was afforded of co-ordinating the views of the medical profession with the experience of the Department in previously administering the Act. In this connection it may not be out of place to note that within the past two years, due to a great extent to the incarceration of a large number of traffickers, with a consequent disorganization of underworld supply, the attempts to obtain narcotics illegally from legal sources have increased nearly 300 per cent. Most of these attempts consist of the forging of prescriptions, telephone

impersonations of physicians, thefts from mails, burglaries, and straight hold-ups; consequently it is necessary to insure that the machinery controlling the legal traffic is so contrived as to afford a sufficient measure of control to prevent the source of supply, when to a certain extent stopped at one end, being transferred to the other. The Act provides that narcotics can only be supplied to physicians, dentists, veterinary surgeons and retail druggists who are registered and in good standing under the legislation governing their professions in the province in which they practise. Thanks to the hearty co-operation of the thirty-six registrars of the various associations and colleges throughout the Dominion, we are kept in constant touch with the numerous changes in the lists of those in good standing, and when the many thousands of narcotic transactions which are reported to this Department monthly by licensed wholesalers are checked against these lists, any transactions not possessing the necessary legislative authority are quickly noted, and appropriate action taken. Drug stores are also inspected to insure that proper narcotic registers are being kept, and transactions shown therein are supported by proper narcotic orders, while sales' reports for varying periods are obtained from retail druggists in various parts of the country. It is obvious that it is useless for a druggist, wholesale or retail, to find out that he has not received a proper order, after he has parted with the narcotics; consequently, we insist that he must have a properly signed order actually on his premises, and passed on by a responsible person before the order is given effect to. This, of course, prevents the filling of telephone or telegraph orders from physicians, and while it is quite realized that this does, in some instances, result in considerable inconvenience and annoyance, the other side of the picture shows reasons which far outweigh any such consideration. It is, for instance, a matter of surprise as to the number of cases, rapidly diminishing, I am glad to state, in which druggists who had previously been remiss in this regard, have been victimized by a telephonic request, purporting to emanate from a physician known to them, that a quantity of morphine and cocaine be sent immediately to the physician's office, when it would be paid for and a narcotic order given. The messenger, usually a boy, on arrival, finds a man claiming to be the physician, and apparently in a great hurry, just outside the doctor's office, who asks if he is from the drug store, receives and pays for the narcotics, and signs the narcotic order, which, on being scrutinized when it reaches the drug store, is found to be a forgery. Many such cases have been followed up by this Department, and convictions obtained. Therefore, I trust that the practising physician will not bear too hardly upon us when we insist upon the discontinuance of telephonic orders, which he may look upon as an arbitrary piece of red tape, but which is, in reality, an absolute essential.

With regard to the forging of prescriptions, we encounter cases where a man will victimize as many as seventy druggists in an area

extending from eastern Saskatchewan to the Pacific Coast; consequently it is essential that the legal traffic in narcotics should be carefully scrutinized.

In connection with the supplying of narcotics to hospitals, no provision exists in the Act for the acceptance of an order signed by other than a physician or the druggist in charge of a hospital dispensary, who is in good standing in his province. There are, of course, many smaller hospitals which have no superintending or resident physician, to say nothing of a dispensing druggist, and there might very conceivably be reluctance on the part of any one of several attending physicians to take the responsibility of signing orders for all the narcotics used in the institution. The hospitals in Canada were, therefore, circularized, the provisions of the law pointed out, and the suggestion made that the point might be covered by narcotic orders being countersigned by the lady superintendent or buyer, but that the signature of a physician or qualified dispenser was an absolute essential.

The previous legislation affecting the use of narcotics in professional practice was carefully reviewed by a special committee of the House of Commons, eight of the ten members of which, as previously pointed out, were medical men. As a result no change was made in the principle thereof, and conditions remained as formerly, namely, that while a physician is at entire liberty to prescribe or furnish narcotics in cases where a medical condition other than addiction exists, it is an offence for him to furnish same to an addict for self-administration.

A new section, however, has been added to the Act, making it an offence for anyone, who, in the course of treatment by a physician, is supplied with narcotics, to obtain narcotics or prescriptions therefor from another physician without disclosing the fact to the first physician. This covers a type of case, unfortunately somewhat common, in which a medical man may be congratulating himself upon the reduction which he thinks he has been able to effect, and yet be completely unaware of the fact, known to us by the inspection of drug stores, that his patient is receiving quantities from other physicians; who are also acting in good faith, far in excess of the patient's legitimate needs, or the quantity he was originally taking.

With regard to ordinary cases of drug addiction, it is universally accepted that any hope of cure by the ambulatory method, by which the patient is allowed to take his supply away with him, is bound to fail, and institutional treatment, or the closest approach thereto possible, in a private house, with the patient in bed and under guard, is indispensable. The practising physician, however, may very pertinently inquire as to what method is open to him when the institutional facilities in his province, for cases of this kind, are practically non-existent. At present the only answer available to this Department is that the responsibility for the care and treatment of addicts, by the provision of institutions therefor, or the making available of accom-

modation in existing institutions with power to commit addicts thereto for treatment, is just as much a provincial obligation as is the care of the tuberculous or the insane, and although this phase of the narcotic problem has been strongly stressed for years past, Alberta is the only province in Canada where both power to commit and provision for treatment exist, although Nova Scotia has passed legislation in that regard without, however, as yet, making it effective by providing the necessary accommodation. If, in such circumstances, this Department allows matters to continue as formerly, the intention of Parliament, as expressed in the Opium and Narcotic Drug Act, is not being carried out, and we are failing in our obvious duty, not only because the law on the subject is perfectly clear, but because from our experience we realize how essential it is to prevent matters remaining as they are and have these unfortunate people continue as addicts for the balance of their lives. Similarly, if they are allowed to carry on as before, and receive what narcotics they want from their attending physicians, everything remains quiescent, and no government, provincial or otherwise, could be expected to undertake the expenditure involved in the provision of institutional treatment if, by reason of everything remaining quiescent, no particular purpose would apparently be served, and with no public opinion apparently demanding a change. This important question has, during the past few months, been widely discussed by the Ontario Medical Association, which body recently interviewed the Premier of that province in an effort to have action taken in connection therewith.

Many persons, on reading the drastic provisions of Section 4 of the Act, which provide for imprisonment up to seven years, and the imposition of the lash, in the discretion of the judge, fail to realize that this section is aimed directly at those selling or possessing narcotics illegally, and does not affect the medical or other professions in the slightest degree in their daily work. In fact, by a subsequent section, the professions are definitely excluded from all its provisions, save those referring to the importation or exportation of narcotics or the unlawful furnishing thereof to a minor. Similarly, while in a new section of the Act, the use of the mails for narcotics is made an offence, this is aimed principally at the trafficker, while physicians, retail druggists, etc., are exempted from its provisions, and can still use the mails, although wholesale druggists, whose narcotic transactions are more concentrated, are limited to the use of the registered mail for straight narcotics or preparations containing more than a certain specified quantity thereof.

The new legislation has also clarified the situation with regard to the preparations above mentioned. A retail druggist may sell, without a prescription, preparations for external skin use only, which do not contain more than two grains of opium or one-quarter of a grain of morphine to a fluid ounce, while if for internal use, they must be labelled with the full formula, and a caution as to it being unlawful to

administer same to a child under two years of age. Provision has also been made that he may sell these preparations without labelling if pursuant to the direction of a physician. The word "direction" is intentionally used in order that a physician may give verbal or telephonic instructions to a retail druggist should he desire such preparations to be dispensed on his order, thus avoiding the necessity of issuing a signed order in connection therewith. Provision has also been made whereby a physician can administer these preparations to a child under two years of age.

When it is realized that there are 8,000 addicts in Canada, and over 2,000 cases in which the medical profession finds it necessary to administer narcotics, the vast majority of those in the latter category being, of course, cases in which such action is abundantly justified, but of which a proportion cannot be so designated, it will, I am sure, be appreciated that the narcotic problem is one which, both from the angle of supervision of the legal traffic and control of the illegal traffic, presents a situation which taxes our endeavours to the utmost. The illicit traffic is thoroughly well organized, and the profits are so huge that money is freely spent in exhausting every form of procedure in the courts in an endeavour to avoid the punishments which traffickers so thoroughly deserve. Many cases come to our notice in which the social results accruing from the underworld traffic are almost beyond belief, and we feel that no effort is too great to relentlessly pursue those engaged in such traffic and endeavour to have imposed upon them the severe punishments which parliament has provided. In so far as the legal traffic is concerned, our attitude is precisely the reverse. In the course of the past two years I have had occasion to correspond with some hundreds of physicians, and have been able to, in some small measure, be of assistance in offering advice in connection with the numerous difficult sets of circumstances which they encounter. It has been a matter of surprise to me, in connection with such cases, to notice the extraordinarily large percentage in which attending physicians have gone to an infinity of trouble in helping their patients, without either hope or prospect of any financial reward whatever. Under these conditions, therefore, it is not only our duty, but a matter of personal pleasure, to be able in one phase of our work to make a small contribution to the efforts which so many practising physicians are making to return to decent citizenship those unfortunates suffering from the curse of narcotic addiction, and at the same time to administer fairly and reasonably the drastic provisions of the Opium and Narcotic Drug Act.

Some Observations on Health Supervision in Secondary Schools*

J. E. DAVEY, M.D.

Chief School Medical Officer, Hamilton, Ontario

FOR some years the physical instructors in the Hamilton secondary schools have been pressing for a physical examination of the pupils in order to determine the nature and amount of exercise best suited to each individual. Frequently these instructors were in doubt as to the advisability of certain pupils taking the exercises, and on the other hand there were pupils who for apparently trivial reasons asked to be excused. The primary object, therefore, of this survey was to determine the fitness of pupils for exercise or the degree of unfitness where such existed.

To be of most service the examinations had to be made in the first two or three weeks of the school year in order that the instructors might begin to organize their classes as soon as possible.

As this was the first opportunity of surveying high school pupils that had come to the school health staff it was felt that as much information as possible regarding the health situation among these pupils should be secured. A special form was therefore prepared. One side was arranged so that the information required could be filled in by the pupil himself. The other side was for the use of the medical examiner. By having the front of the card completed in advance much time was saved. A copy of the form used is given below.

Front

BOARD OF EDUCATION STUDENT'S MEDICAL EXAMINATION REPORT

				Hamilton.....192	
Name in Full				Address	
Surname first					
Institute					
Age:	Years	months	Height:	Weight:	Below Above Normal lbs.
Have you ever had: Diphtheria, scarlet fever, measles, whooping cough, influenza, convulsions, fainting spells, rheumatism, asthma, pleurisy, anaemia, ear abscess, chronic cough, loss of weight, tonsilitis, quinsy, paralysis, chorea, frequent colds, severe headaches, or any other serious illness or operation? (Give particulars below.)					

*Delivered at the Annual Convention of the Ontario Educational Association, Toronto, April, 1929.

Nature

Date

Duration

Were you ever advised not to take part in games or exercises or to remain out of school on account of your health?

By whom?

Why?

What outdoor games do you play?

Do you tire easily?

To what extent have you taken part in athletic competitions?

Nature?

Began at age?

Back

PHYSICAL EXAMINATION

Posture:—Head:

Shoulders:—Uneven, forward

Kyphosis, Lordosis
Spine: Scoliosis

R
Sight L

R
Hearing L

Nose

Thyroid

Glands

Skin

Teeth

Tonsils

Vaccination

Feet

Pulse:—rate

quality

Respirations

Rupture

Veins

Lungs:—Expansion:—Symmetrical

inches

Percussion

Auscultation

Heart:—Apex beat

Space

Inside-outside N.L.

Thrills

Murmurs

Reaction to exercise

Nutrition:—good, fair, poor

General Development,—good, fair, poor

Deformities

Exercises Recommended:—full, moderate, light, graded, special, none.

Remarks:

..... Physician.

The examinations were begun as soon after the opening of school in September, 1928, as possible. Four female physicians examined the girls and two male physicians examined the boys. For purposes of record special attention was given to those who had engaged in competitive athletics. The ages ranged from 11 to 19 years, and there were 1,133 girls and 1,041 boys examined.

A summary of the findings is given herewith and speaks for itself:

1. Number examined.....	2,174
2. Full exercises recommended.....	1,819
3. Special exercises recommended:	
for (a) Posture.....	*767
(b) Hearts.....	103
(c) Chests.....	27
(d) Recent illness or injury.....	21
(e) Malnourished:	
Overweight.....	30
Underweight.....	72
Anaemias, etc.....	3
(f) Orthopedic:	
Infantile paralysis.....	11
Birth paralysis.....	4
Other causes.....	38
(g) Other causes.....	30
Total.....	1,106
4. No exercises recommended:	
(a) Hearts.....	23
(b) Chests.....	5
(c) Recent illness or injury.....	10
(d) Orthopædic.....	8
(e) Other causes.....	9
Total.....	55
5. In need of medical attention:	
(a) Sight.....	140
(b) Hearing.....	12
(c) Other causes.....	137
Total.....	289
6. Goitres.....	293
7. In need of dental attention.....	195
8. Vaccinated against smallpox.....	1,254
Not vaccinated against smallpox.....	920

A perusal of the figures shows not only how well founded were the fears of the physical instructors but, in addition, the necessity of having some form of medical service in secondary schools.

In reviewing the literature on this subject I find there is very little information recorded, but, where any is found, it all points to the same conclusion: that there is great and urgent need for the proper medical supervision of our youth between 10 and 20 years of age. There are various reasons given for the present lack of this supervision, chief among which are, firstly, that the community does not demand or value health service for high schools as for public schools; secondly, that the high school staff, as a rule, has neither the interest nor the

*Most of these were also able to take full exercises, and are included in the figures for full exercises.

knowledge to properly meet this need; and thirdly, that there is a lack of a health education programme suited to the needs of the high school level.

In an address entitled "The Neglected Age," Miss Whitney, of New York, gives some striking figures in regard to the prevalence of tuberculosis among the high school age group in the United States. She states as follows:

That the *general* decline of the death rate from tuberculosis during the last ten years has been 36 per cent, whilst the decline in the 15 to 24 age group is only 18 per cent.

Arranged according to group ages we find:

From	1 to 5 years	50 per cent decline in death rate
"	5 to 14 "	41 " " " "
"	15 to 24 "	18 " " " "
"	25 to 44 "	42 " " " "

It was further shown that the death rate was higher from 15 to 19 than from 20 to 24.

In the 15-19 group the females were 75 per cent more than males.

In the 20-24 group the females were 25 per cent more than males.

Also that while the group 15-24 comprised 17 per cent of the total population it furnished 26 per cent of the deaths.

Edna W. Bailey, Ph.D., Associate Professor of Education in the University of California, states that in 1920, in the age group 10-19, tuberculosis caused 20 per cent of total death rate, while pneumonia caused 17 per cent of the total death rate in this group. She further states that one-third to one-half of all absence from high schools due to illness is caused by influenza and the common cold. She was also able to contrast the findings in regard to defects and disorders among public school pupils with the findings among high school graduates with the following results:

The high school group showed an improvement in teeth, tonsils and orthopaedic defects among boys; but showed a worse condition in malnutrition, orthopaedic conditions among girls, hearing, sight (2 or 3 times), hearts (3 times), lungs (3 times), skin diseases, abnormal thyroids, constipation, and indigestion.

Many reasons have been given for the increased illness and higher death rates in the age group 11 to 20. Among others are the following: Increased industrialization, extra-curricular activities, late hours, scarcity of clothing and the "hardening" process, adolescent changes, poor food habits and dieting fads, poor ventilation, carelessness in spread of contagious diseases (colds, etc.), less careful supervision by mothers, competitive athletics.

To quote again from Edna Bailey:

"Interschool competition may be wholly eliminated from girls' athletics with great advantage and no loss." And again, "The weight of influence of all enlightened adults should be thrown against interschool competition for boys and for girls at the secondary level."

Whether or not these statements are too strong can only be shown when an efficient medical inspection programme has been inaugurated in the high schools of our country and sufficient data have been secured to furnish the evidence.

Meanwhile certain definite conclusions force themselves upon us, viz.:

1. Secondary schools undoubtedly require an adequate medical inspection service.

2. There should be a health instruction programme suited to the needs of high school standards.

3. Medical inspection of high school pupils without the necessary follow-up services of a nursing staff is inadequate.

4. Suitable record forms whereby the findings and recommendations of the public school health supervision of the pupil may be carried over into the high school for reference and addition are a necessity.

The Pathology of Silicosis of the Lung

By

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SILICOSIS is a very important industrial disease at the present time. In Ontario it affects chiefly the gold miners of certain localities in the north; granite-cutting is the next most important contributor, while metal grinders, employed in all kinds of industries, frequently develop the disease from dust thrown off by stones which owe their abrasive qualities to silica. Occasionally cement workers and quarrymen are affected. Though the disease is recognized by legislation and made compensatable, it continues to show an alarming prevalence. It requires a very profitable business nowadays to withstand the heavy compensation expenses incidental to the more hazardous trades; indeed, in some of the industries silicosis represents a formidable economic problem.

Recently (1929) Dr. F. M. R. Bulmer of the Ontario Department of Health invented a compressed air respirator which will greatly benefit stationary workers, such as granite-cutters and metal grinders, and may also be practicable for certain types of mine work. By it the worker is supplied with a continuous flow of pure air piped from a distant source under pressure; he does not inhale the atmosphere of the working place. It is the only efficacious mask yet brought forward which can be continuously worn by workmen without producing discomfort, and its enormous value can hardly be estimated. In the mining industry the matter of prevention has taken great strides but still presents many difficulties. Mavrogordato reports from South Africa (1926) that 2 mgm. of dust per cubic meter is sufficient to produce the disease and it is well nigh impossible to purify mine air beyond this point.

Clinically the study of the disease has pretty much reached a standstill but pathologically it presents many aspects which invite investigation.

Compounds of silicon comprise about 28 per cent of the earth's crust. The element manifests itself chiefly in two forms:

(i) Silica or oxide of silicon (SiO_2) which exists in crystalline and amorphous forms. The best examples of the crystalline form are rock crystal, quartz, quartzite, flint and sandstone, which, taken together, form a large proportion of all hard rock. The best examples of the amorphous form are opal and the diatomaceous earths.

(ii) Silicates, of which clay (aluminium silicate) is an example.

Only workers exposed to the dust of certain hard rock are prone to develop silicosis. Thus, the blame is laid at the door of crystalline silica whilst the dusts of amorphous silica and the silicates are considered to be innocent.

MATERIAL STUDIED

Under the direction and invaluable guidance of Professor Oskar Klotz, an examination of twelve cases was undertaken with a view to studying the nature and distribution of the mischief-making dust and its relationship to the characteristic lung lesions. Six of these cases were autopsied at the Department of Pathology, University of Toronto. The others were collected by Dr. A. R. Riddell of the Ontario Department of Health who has generously supplied pathological material and clinical detail in each case. The accompanying chart contains some essential information respecting the individuals and also certain findings arising from autopsy examinations.

It is convenient to consider silicotic lesions as of different stages.

(1) Early lesions, the earliest in point of time are rarely seen; they consist of a collection of finely divided foreign material containing many silica fragments; it is surrounded by beginning fibrosis, wisps of which may be seen growing into the dust deposit; such a lesion will eventually become a nodule; as it heals, dust cells will lay down more silica around its periphery and a progressive lesion will ensue.

(2) Progressive lesions are those which have a healed centre and a spreading periphery; silica fragments are absent from the healed part but numerous where the tissue reaction is proceeding; it is through the progression of contiguous lesions that massive fibrosis occurs.

(3) The healed lesion is most frequently encountered and presents constant characters; it is made up of anuclear, mature collagen material frequently laid down in basket work formation; the interstices contain small amounts of finely divided foreign material; they are for the most part free from crystalline silica; the lesion is usually nodular in type but diffuse patches do occur; individual nodules are small, averaging something less than 1 mm. in diameter; as the disease progresses they become agminated into units which apparently represent lung lobules; these coalesce to form large areas of massive fibrosis.

(4) Dust collections occur frequently between and around healed lesions; they are often in an avascular area where further tissue reaction is impossible; some of these dust rests are rich in silica fragments; these foci may be called for convenience "silica nests"; they are actual or potential lesions and apparently the points most vulnerable to tubercle infection.

(5) Foci of degeneration develop in areas of massive fibrosis; they are quite small, rarely more than 1 mm. in diameter and they represent

GROUP ONE

CLINICAL DATA

Case No.	1	2	3	4	5	6
Age of Patient	45	37	30	50	46	31
Industry and Occupation ...	Gold mining Drill operator	Mining ?	Cement making ?	Implement factory Metal grinder	Granite- cutting Stonemason	Gold mining ?
Period of Exposure.....	10 years	?	?	?	27 years	?
Period preced- ing death dur- ing which pat- ient was not exposed to dust.....	9 months	6 weeks	?	3 years+	3 years+	9 months
Clinical grada- tion of case ...	Secondary	Not diagnosed (Ante- primary)	Not diagnosed (Secondary)	Not diagnosed (Secondary)	Secondary	Not diagnosed (Ante- primary)

POSTMORTEM FINDINGS

Cause of death	Tubercul- ous broncho pneumonia	Acute nephritis with lobar pneumonia	Mil. tuberculosis (primary in lung)	Mil. tuberculosis (primary in lung)	Heart disease	Subacute nephritis
Silica content expressed as % SiO ₂ in ash of lung.....	28.65	?	20.49	23.12	6.24	?
Average no. of doubly refract- ing particles in 4 or more sel- ected high power fields...	36	16	3	6	8	96
Exogenous pigment pre- sent.....	Carbon- aceous Argill- aceous Iron	Argill- aceous Iron Carbon- aceous	Argill- aceous Carbon- aceous Iron	Carbon- aceous Argill- aceous Iron	Carbon- aceous Argill- aceous	Argill- aceous Carbon- aceous

GROUP TWO

CLINICAL DATA

Case No.	7	8	9	10	11	12
Age of Patient	41	35	31	54	51	40
Industry and Occupation ...	Mining Various	Gold mining Drill operator	Gold mining Various	Stone- quarry Crushing- room helper	Gold mining Drill operator	Gold mining Drill operator
Period of Exposure.....	13 years	8 years		4 years	6 years	10 years
Period preced- ing death dur- ing which pat- ient was not exposed to dust.....	0	2 months	3 years+	1 year	1 year	7 months
Clinical grada- tion of case...	Ante- primary	Secondary	Secondary	Secondary	Primary	Secondary

POSTMORTEM FINDINGS

Cause of death	External violence	Pneumonia	Mil. tuberculosis (primary in lung)	Mil. tuberculosis (primary in lung)	Unknown (Mitral stenosis)	Tuberculous broncho- pneumonia
Silica content expressed as % SiO ₂ in ash of lung.....	20.85	34.81	15.23	33.26	33.20	45.32
Average no. of doubly refract- ing particles in 4 or more se- lected high power fields...	14	83	37	3	65	28
Exogenous pigment pre- sent.....	Carbon- aceous	Argill- aceous Carbon- aceous	Argill- aceous Carbon- aceous	Argill- aceous Carbon- aceous	Carbon- aceous	Carbon- aceous

the oldest parts of the lesion; there is no sharp line demarcating the degeneration but rather a very gradual transition occurs from laminated collagen strands inwards to a textureless, granular centre which often contains a group of cholesterol crystals. These degenerative changes may be of a benign nature so far as the welfare of the patient is concerned. Case No. 5 presented numerous areas of this kind but this lung was entirely free from infection.

CHEMICAL DETERMINATIONS AS COMPARED WITH MICROSCOPIC APPEARANCES

In ten cases portions of the lung were submitted to chemical analysis for the purpose of determining the amount of silica present. This work was kindly undertaken by Mr. H. E. Rothwell E.Sc., of the Ontario Department of Health: he employed the gravimetric method. The results are expressed as percentage SiO_2 in the ash of the lung. Microscopic sections were made in each case of the tissue situated adjacent to the blocks used for the chemical tests, so that the microscopic findings might be correlated with the local content of chemically demonstrable silica. The average number of crystalline silica fragments seen by polarized light in each of four or more selected high power fields is indicated in the chart (page 497). It will be seen that there is no parallel between the amount of visible crystals and the per cent of SiO_2 in the ash. The greatest disparity occurred in a lung which did not show more than four or five crystals in any one high power field and yet silica constituted 33.26 per cent of the ash; the rock this man had been working in was 95 per cent free silica. On the other hand, eighty-three fragments per high power field to 34.81 per cent in one case, and sixty-five to 33.20 per cent in another represented instances in which a large proportion, if not all, of the silica was demonstrable microscopically. The other seven cases fall in between the two extremes.

That portion of the silica which is present in an invisible and unrecognizable form is designated for convenience as "occult". It can only be measured very roughly as the degree of discrepancy between the visual and chemical indices. It is proportional to the amount of fibrosis present in the immediate vicinity. Thus the case presenting a maximum amount of occult silica was very heavily indurated with typical massive silicotic fibrosis.

In most of those with a relatively small proportion of occult silica, fibrosis was early or slight. One case in particular had a count of sixty-five fragments per high power field and 33 per cent silica in the lung ash. This man had been exposed to mine dust for some years but showed very slight fibrosis. Likewise the occult moiety of the silica fixed in the tissue was relatively very small.

It is evident in the study of microscopic sections that the formation of mature fibrous lesions is coincident with the disappearance of silica

crystals in the immediate vicinity. Sometimes within a healed silicotic nodule, birefringent particles may be seen lying along with pigmented foreign material in the interstices, but these are fewer in number and noticeably smaller than the fragments lying outside in the loose tissue. Watkins-Pitchford was probably the first to make this observation. It seems probable then that it is by virtue of the silica undergoing a change into the occult form that the fibrous reaction arises.

It follows that the more readily this change in the silica is brought about, the more serious is the tissue reaction. This factor may be linked up with the variability in individual susceptibility to silicosis. Thus Dr. Riddell reports that Case No. 10 came down with secondary silicosis after four years' exposure whilst a work-mate labouring under identical conditions shows no radiographical changes in his lungs to this day (four years since the death of Case No. 10). Of course Case No. 10 was complicated by tuberculous infection which speeded the fatal outcome, but gross and histological examination of his lungs leave no doubt that the greater part of the fibrosis is typically silicotic in origin.

In what form is the occult silica? Watkins-Pitchford and Moir have claimed to demonstrate a huge proportion, as high as 99 per cent, of particulate silica in silicotic lung tissue is invisible in ordinary histological preparations. The optical properties of silica are such, they claim, as to cut out a large proportion of the tiny fragments which would ordinarily fall within the range of visibility. If the tissue be digested with HNO_3 from, according to them, a histological preparation of silicotic lung leaving the particulate matter in situ, a large number of previously invisible crystals are brought into view. Their technique has been carefully carried out on sections from the cases showing a relatively high proportion of occult silica, but virtually no more particles were demonstrated in this way than could be detected previously in the same fields by the polariscope. Using a strong light, high magnification and a rotating stage, all the silica crystals present of 0.5μ or more in maximum dimension can be seen. The South African workers apparently failed to use the rotating stage; only about one-half the silica fragments in any one field are visible at one time; to bring them all into view in turn the field has to be rotated through 180 degrees.

From these observations it is shown that the occult silica is not in the form of particles that can be made visible; it is in a much more finely divided state.

Gye and Purdy have shown that colloidal silica is toxic to rabbits when administered parenterally. This substance, $\text{Si}(\text{OH})_4$, called also silica sol and orthosilicic acid, is derived from silica by the addition of two molecules of water. These authors point out that the circulation of silica in animal and plant economy is dependent upon this transformation which is accomplished by soil bacteria. The most readily formed soluble derivative of silica is then a poisonous substance. Colloidal silica, if left to stand, becomes altered by dehydration into

silica gel, H_2SiO_3 , or metasilicic acid which is apparently non-toxic. This reaction is irreversible. Injecting a suspension of silica particles subcutaneously into a mouse, Gye and Kettle produced what they call "almost a specific lesion", in every respect similar to that produced by colloidal silica save that it took much longer to develop. The delay is interpreted as the length of time necessary to permit of the change within the tissue from SiO_2 to $\text{Si}(\text{OH})_4$.

Turning, then, to the problem of human silicosis, these authors judge it probable that inhaled silica is slowly transformed by the tissue juices into colloidal silica, either directly or through the intermediate form of sodium silicate, which is easily broken down by carbonic acid. To this hypothesis is denied the opportunity of proof but the observations gleaned from the present study tend in every way to support it.

The following, then, is the sequence of events presumed to lead to silicosis in a lung. Silica fragments are transported into pulmonary tissue spaces by phagocytes; they come to rest in small collections in the peribronchial lymph glands or pleural dust rests, or they are arrested out in the lung parenchyma by blockage of the lymph channels; in course of time the phagocyte disintegrates, liberating its load of siliceous dust into a tissue space; slow chemical change of the silica takes place with the production of a poisonous derivative which produces a local injury; slow proliferation of fibrous tissue is the response to this injury; the lesion may be nodular or diffuse according to the morphology of the silica deposit which in turn is partly dependent upon the conformity of the lymph space in which it is lodged.

What happens to the silica after it has reached the colloidal state? As has been seen in some of the cases, considerable occult silica was present in the lung some months after the patient quit his dusty trade. In these, the silicotic lesions as far as could be determined were practically all healed; from which it may be argued that the healing of the tissue injury is accompanied by a transformation of the colloidal silica into an inert form, probably silica gel. Here, then, is an explanation why the occult silica remains in the tissues so long; were it simply in the colloidal form it would surely diffuse about and leave the lung in a relatively short time but if it has undergone the irreversible change into a gel, then it will diffuse very slowly.

That the silica does eventually leave the lung seems well illustrated by Case No. 5. This individual was a stonemason with an occupational history extending over twenty-five years. The last three years of his life were spent in a House of Industry. He died of myocardial failure. The mid portion of each lung was solidified with black rubbery fibrosis laid down in closely packed circumscribed nodules which apparently corresponded to lung lobules. The lung tissue throughout was absolutely free from infection. The silicotic fibrosis, which was quite typical save for its localization to the mid part of the lung, evidently represented the type of lesion resulting from very prolonged exposure to relatively small doses of dust. The spongy emphyse-

matous parts of the lung contained 1.2 per cent silica in the ash. Solid fibrosed portions contained 6.2 per cent. There was no sign of early or progressive lesions nor were there any silica nests; all the individual lesions were fully healed. Some presented a central area of degeneration in which a cluster of cholesterol crystals was usually found. With crossed Nicol prisms a few very small silica crystals could be seen distributed sparsely along with pigmented foreign material in the fibrous interstices. These were diminutive in size and number like those fragments seen in healed lesions of other cases. Thus presuming that the degree of fibrosis present in this individual was produced by a greater amount of silica than can be demonstrated within his lung, one concludes that the occult silica after becoming inert was in some way removed from the lung.

Some of the chemical determinations and microscopic examinations were made of tissue preserved as long as five years in various mounting fluids. Though these fluids are almost invariably slightly acid in reaction, they may occasionally be alkaline and therefore liable to dissolve finely divided silica fragments. It is possible that some of the occult silica found in certain cases may have been formed by the action of a preserving fluid. Against this possibility is the fact that the outstanding case (No. 10) was examined so soon after death as to preclude the possibility of this error; in other instances (*e.g.* No. 6), histological preparations made some years after death showed large numbers of silica fragments, so that the mounting fluid apparently had no effect on these; finally, if the fluid were able to dissolve silica, one would expect it also to erode the glass receptacles, but this has never been observed.

The condition of silicosis is theoretically progressive, as long as undissolved silica remains in the tissue. This contention is borne out clinically by the report that many South African miners who showed clear roentgenograms before leaving to fight in the Great War, returned with marked silicosis. Quitting a dusty trade does not at once arrest the progress of the disease unless all the undissolved silica fragments are extruded from the lung before they produce any injury. This process of extrusion was observed in two of the cases under review. There were dust-laden phagocytes in the alveoli which contained silica crystals. These were obviously outward bound since neither patient had been exposed to dust for seven months or more before death. In both cases there was a condition of oedema present in the lungs; one had hydraemic nephritis and the other chronic passive congestion. Oedema seemed to be the factor favouring the outward migration of dust cells. This is in line with the experiments of Haythorn who found that oedema reactivated quiescent dust-laden phagocytes and endowed them afresh with amoeboid motility. There are other factors too which determine an exodus of dust cells from the lung. It is a well known fact that colliers often expectorate carbon tinged sputum for some years after leaving the mines. Mavrogordato attributes this to

a sort of aseptic catarrh induced by coal dust in the lung parenchyma which stimulates an outward migration of dust cells. He has shown in experimental animals that inhalations of coal dust before or synchronous with silica dusting prevents the development of silicosis. Similarly, Haldane has observed that the dust of shale and certain clays inhibits the ill effects of silica. In all probability the virtue of these dusts lies in the fact that they produce a steady exodus from the lung of phagocytes which carry out silica as well as other dust particles. The relative immunity of colliers to pulmonary tuberculosis may be explained on the same ground. In any case, this process appears to have an important influence on the progress of silicosis.

DISCUSSION

Mavrogordato (1926) believed that silica particles bring about lung damage by fixing and preserving the endothelial cells which phagocyte them. He expresses the anomalous view that such mummified dust cells eventually become directly transformed into white connective tissue fibres which retain the ingested particles within them and then assemble to form the well known fibrotic nodule of the silicotic lung. Haythorn (1914) demonstrated an unusual longevity in dust cells, even those containing only carbon. Mavrogordato has apparently interpreted the same phenomenon as being due solely to a peculiar preservative action of finely divided silica. There are no observations arising from the present study which would suggest a transition from wandering endothelial cell to fixed tissue fibres; on the contrary, there is evidence against such a metaplasia; direct continuity between the anuclear fibres and vegetative connective tissue was frequently seen at the periphery of the lesion; there was no instance of foreign material being phagocyted within a fibroblast or fibrous cell; with the binocular microscope, in doubtful instances, it can invariably be demonstrated that the particles lie outside the fibrous elements, above or below; finally, the Masson and Mallory special stains differentiate collagen, young and old, very beautifully from endothelial cells so that there need be no confusion as to the identity of these two tissue elements. The theory of Mallory, that the wandering endothelial cell is distinct from the fibroblast in its immediate origin, function, staining qualities and ultimate fate seems to have been fairly well established by Permar and others, and there are no features of the reaction to silica which in any way contradict it.

Gardner (1923) believed that the silica-laden dust cells plug afferent lymphatic channels from the hilus outwards in a progressive manner and that the fibrosis is essentially perilymphatic, arising as a result of congestion and dilatation of the lymph vessels. He considers that the tissue reactions are not attributable to any chemical action of silica since very little of the dust can be seen in outlying fibrotic areas. This last point we have dealt with fully elsewhere. Gardner's observations

were made upon early silicotic lesions in experimental animals; his theory does not account for discrete silicotic nodules surrounded by normal tissue such as have been found frequently in peribronchial lymph glands of the present series. Moreover, Gardner gives no satisfactory explanation as to why the dust cells should plug the lymphatics in the first place. Surely fibrous proliferation in and around the lymph space is the primary step.

Failure to emphasize the importance of employing a polariscope in the microscopic study of silicotic lungs would leave the discussion

Fig. 1

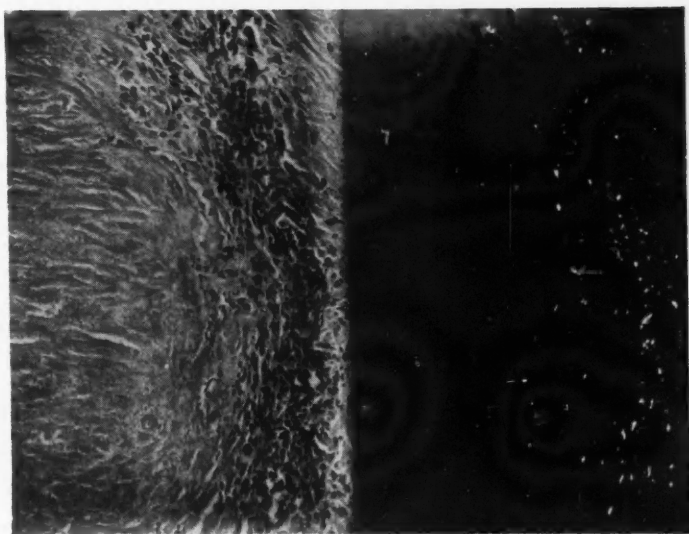


Fig. 1—Microphotograph showing double view of the same field, the one to the left taken by polarized light, the one to the right by ordinary light. Magnification 100. Polarized light shows a large number of silica fragments, the location of which is seen in the other picture to correspond, in the main, to the loose cellular tissue lying around the outside of a healed fibrotic nodule.

This collection of dust fragments is what has been referred to as a "silica nest" in the text.

Within the area of fibrosis the silica fragments are seen to be markedly diminutive in size and numbers.

incomplete. Silica fragments in the ordinary histological preparations cannot be recognized save by the crossed Nicol prisms. There is no type of pigmented foreign material which constantly accompanies the noxious crystalline particles, so that, though they are commonly accompanied by coal dust and finely divided argillaceous material, yet their presence can only be established by examination with polarized light. Nicol prisms fitted to an ordinary microscope (one in the eye-

piece and one in the condenser) serve admirably. A rotating stage such as a petrographer employs is a useful adjunct. It is best to use an arc light strong enough to illuminate the field when the prisms are crossed. There are many particles other than silica which have doubly refracting qualities and which one must learn to distinguish. Lipoid bodies and cholesterol are examples; these are eliminated by the paraffin embedding process. Erythrocytes and their fragments sometimes provide a confusing element but may be distinguished by a uniform pink tint. Occasionally needle-shaped crystals form in Canada balsam, especially in old slides; these are removed by gently heating. Finally it is necessary to clean the slide thoroughly as particles of lint are also frequently doubly refracting.

One soon learns to distinguish silica fragments by their characteristic size, shape and distribution. The majority of them appear acicular; they vary in length from 0.5 to 12 μ , averaging about 4 μ . Sections cut 4 to 8 μ in thickness, stained with haematoxylin-eosin and mounted in Canada balsam have proved satisfactory for the examination.

Failure to demonstrate silica with the polariscope does not, however, rule out silicosis. The silica may be in an occult form and only capable of detection by chemical analysis.

RELATIONSHIP OF TUBERCULOSIS TO SILICOSIS

A large proportion of all sufferers from silicosis die of phthisis; superadded tubercle infection spreads rapidly and invariably proves fatal in a short time. Why silicosis should render the lung especially vulnerable to tuberculosis has been the subject of much theorizing in the past. Blocking of lymphatic exits of the lung has been held responsible. In this connection it is interesting to note that exactly the same reason is advanced to explain the relative immunity of colliers to tuberculosis. Mavrogordato believes that silica dust secures the fixation of so many endothelial cells in the lung that there are not enough left to successfully combat tubercle invasion. It has been held also that susceptibility to silicosis goes hand in hand with a constitutional predisposition to tuberculosis. Gardner advanced the view that phagocytes were attracted from a tuberculous focus to silica fragments in outlying regions. He thought it possible that the phagocytes spread the infection in this way. Avascularity of the fibrosed areas is still another reason invoked.

Heffernan and Green (1928) have drawn attention to experimental work which purports to show that colloidal silica, by its powers of adsorption, binds the complement of human serum so that anti-bodies are prevented from attacking tubercle bacilli; they explain the high incidence of tuberculosis in miners on this ground. Their work also arouses interest in a wide range of phenomena connected with the relationship of colloids to biological processes.

Six cases out of the twelve died of tuberculosis; each succumbed within a year of the first frank tuberculous symptoms, thus illustrating a characteristic rapidly fatal course. The lungs of each case presented many changes in common. It was always observed that caseation took place in those areas which remained air-containing, while fibrosed patches invariably escaped necrosis. Microscopic examination showed innumerable instances of fibrous nodules surrounded completely by caseous necrosis. Sometimes a silicotic nodule bordering directly on caseous material showed some disintegration of its peripheral fibres but in no place did the tuberculous process appear to take origin within such a lesion. There was no cellular reaction in the vicinity of fibrous lesions; necrosis appeared to have spread deeply between them without encountering any resistance. Silica crystals were seen scattered widely through the caseous material. Cellular reaction was confined to the outlying edges of the necrotic areas. In regions remote from the fibrous patches, and in areas of more normal lung tissue, it was not uncommon to find exuberant response to the tubercle invasion. Here the endothelial and connective tissue reaction was excessive. This change is what evidently accounts for the fuzzy outline of X-ray shadows which are distinctive of tuberculo-silicosis.

It seems clear from these observations that the infection gains a stronghold in what have been previously described as silica nests. It is from these sites apparently that the infection spreads; they show no reaction; silica fragments which are ordinarily gathered closely together in clusters are now scattered freely through the necrotic area as if the tuberculous process had swept through the dust rests scattering the foreign material on the crest of the flood. The exuberant tissue response at the outlying margin is attributable then to the double stimulus of silica plus tubercle bacilli.

In their experimental subcutaneous lesions produced by silica injections, Gye and Kettle found that tubercle infection when introduced gained an unusual advantage. The organisms seemed to multiply enormously before the animal's defensive forces reached them. They concluded that the coagulum in the centre of the silicotic lesion afforded the bacilli a protective medium which was very favourable to their growth.

It seems that this is the essential factor in human tuberculo-silicosis. The histopathological picture strongly suggests that tubercle infection gains a headlong start in silica nests where the tissue is probably devitalized by the action of colloidal silica and the blood supply is inadequate for any kind of defence or repair. One finds such foci more particularly in advanced cases where there is much fibrosis of a nodular type; this tissue tends to be avascular and throughout it, between the small individual fibrous lesions, are the collections of unaltered dust, potential, if not actual, silicotic lesions, in which the tubercle bacillus finds a *locus minoris resistentiae*. The probable path of entry for the

organism is by aspiration. One may readily suppose that dust cells convey organisms as well as foreign particles into the danger zones. Here the organism finds a favourable and protective medium. In early cases of silicosis one finds collections of silica dusts in the lung tissue 'tis true, and might well expect tuberculosis to be a serious hazard at this, as well as at later periods, if our hypothesis is to hold water. But in early stages the greater vitality, greater vascularity and greater normality of the lung tissue surrounding the dust rests probably

Fig. 2



Fig. 2—Relationship of healed fibrotic lesions to tuberculous process. Microphotograph, ordinary light x 80.

To either side are seen areas of close grained fibrous tissue, representing healed silicotic lesions. Between them is a zone of caseous necrosis containing scattered dust particles and silica fragments (invisible). This zone would correspond to the site of a silica nest before tubercle invasion. There is no tissue response in this region.

reduces the hazard and accounts for early cases of silicosis being as a rule less susceptible to tuberculosis than advanced ones.

Many people have thought it noteworthy that peribronchial lymph glands remain singularly free from tuberculous change in advanced cases of tuberculo-silicosis. However, it is not unusual to find the same condition in cases of uncomplicated tuberculosis of the lung. Blockage of the lymphatic exits plays a questionable part in favouring tuberculosis. It is advantageous in this respect that it tends to prevent the disease spreading to other parts of the body and minimizes the

absorption of toxic products, but whether or not the lung suffers disproportionately in consequence is a matter of uncertainty.

One case only in the series succumbed to pneumonia. This man presented advanced silicosis and the fatal outcome was undoubtedly determined by failure of the pneumonia to resolve. Complete blocking of lymphatic exits, as Haythorn has shown, influences the course of a pneumonia very unfavourably. Patients with advanced silicosis, as in this case, more usually contract tuberculosis than pneumonia. The latter disease is the greater hazard in earlier cases when dust inhalations

Fig. 3

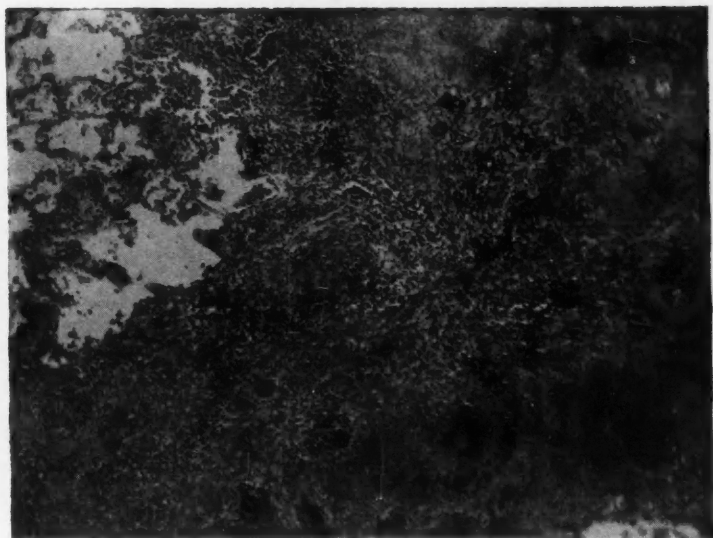


Fig. 3—Microphotograph, ordinary light; X 80.

This picture was taken very close to No. 2. It shows the outlying edge of the same caseous area hemmed in with an exuberant cellular reaction. The necrotic material is littered with dust particles and with tubercle bacilli; there is therefore a double stimulus to tissue reaction. Undoubtedly this is the type of growth which gives the fluffy outline to X-Ray shadows in cases of tuberculo-silicosis.

are copious and fibrosis slight. According to Collis, conditions favourable to pneumonia are usually inimical to tuberculosis and vice versa.

In conclusion, attention is drawn to the fact that two of the twelve cases died of nephritis. Professor Collis and others have noted a relatively high incidence of Bright's disease amongst miners. The experiments of Gye and Purdy show intravenous silica sol to be toxic to kidney but in the human the relationship between silicosis and nephritis has not been investigated.

CONCLUSIONS

Chemical determinations along with microscopic examination of human silicotic lungs tend to support the view of Gye and Kettle that crystalline silica works its ill effects in tissue by undergoing a slow chemical change into an occult (probably colloid) form.

The histopathological picture of tuberculo-silicosis suggests that under the influence of finely divided silica in "dust rests" in avascular areas of silicotic lungs, tubercle infection gains a ready foothold. These foci evidently constitute the most vulnerable quarter of the silicotic lung, and they are most numerous in those cases of silicosis which have continued to inhale silica dust after fibrosis has set in.

Histological study seems to indicate that collections of silica dust in the lung make either actual or potential lesions: if located in an adequately nourished tissue, fibrosis will progress until all the silica fragments become invisible; if implanted in a region already containing many fibrosed lesions, a superadded local injury ensues by the action of the silica, and though further tissue reaction is not likely to occur, yet these foci, as mentioned above, provide added tubercle hazards. In theory, then, the disease must be progressive for some time after the individual leaves his dusty occupation, the progression either taking the form of increased fibrosis or of increased susceptibility to tubercle infection. The greater the fibrous response to any given dust collection, the less does that lesion favour tubercle invasion. An individual after leaving his dusty trade, having progressed to the stage of completed fibrosis, that is, a condition in which there are no remaining "silica nests" in his lung, is no longer a special tuberculosis risk.

Progression to a stage of completed fibrosis is dependent upon: (1) the period of freedom from exposure, (2) the amount of old fibrosis in the lung, (3) the ability to extrude dust fragments by outward migration of phagocytes, (4) the facility with which silica takes on its toxic properties in the individual lung, and, (5) whether or not tuberculous infection is present.

BIBLIOGRAPHY

- Collis, E. L.: *Summary of Present Knowledge of Pneumokonioses. Milroy Lectures 1915, Public Health, Vol. xxviii, 11 and 12; Vol. xxix, 1 and 2.*
- Cooke, W. E.: *Asbestosis. Brit. Med. Jour., 1927, 2: 1024-1026.*
- Gardner, L. U.: *Studies on the Relation of Mineral Dusts to Tuberculosis. Amer. Rev. Tuberc., Pt. 1, 1920, 4:734; Pt. 2, 1922, 6:782; Pt. 3, 1923, 7:344.*
- Gye, W. E.: *Editorial. Silicosis. Lancet, 1921, 201:83.*
- Gye, W. E. and Kettle, E. H.: *Silicosis and Miners' Phthisis. Brit. Jour. Exp. Path., 1922, 3:241-251.*
- Gye, W. E. and Kettle, E. H.: *The Pathology of Miners' Phthisis. Lancet, 1922, 203:855-856.*
- Gye, W. E. and Purdy, W. J.: *The Poisonous Properties of Colloidal Silica. Pt. 1—The Effects of the Parenteral Administration of Large Doses. Brit. Jour. Exp. Path., 1922, 3:75-85.*
- Gye, W. E. and Purdy, W. J.: *The Poisonous Properties of Colloidal Silica. Pt. 2—The Effects*

- of Repeated Intravenous Injections on Rabbits; Fibrosis of the liver. *Brit. Jour. Exp. Path.*, 1922, 3:86-94.
- Hague, O. G. and McBain, R. W.: Silicosis as an Industrial Hazard in Ontario Gold Mining. *Amer. Jour. Roentgenol.*, 1927, 18:315.
- Haldane, J. S.: The Effects of Mine Dust Inhalation. *Engineering and Mining Journal*, 1918, 106:475.
- Haythorn, S. R.: Some Histological Evidences of the Disease Importance of Pulmonary Anthracosis. *J. Med. Res.*, 1913, (New Series) Vol. xxiv, 2:259-279.
- Heffernan, P. and Green, A. T.: The Method of Action of Silica Dust in the Lungs. *Jour. Ind. Hyg.*, 1928, x:272.
- Hoffman, F. L.: Pneumoconiosis in the Stone Industry. *Amer. Rev. Tuber.*, 1922, 6:772.
- Klotz, O.: Pulmonary Anthracosis—A Community Disease. *Amer. Jour. Pub. Health*, 1914, IV.
- Mavrogordato, A.: Studies in Experimental Silicosis and Other Pneumokonioses. *Pub. South African Inst. Med. Res.*, March 31st, 1922.
- Mavrogordato, A.: Contributions to the Study of Miners' Phthisis. *Pub. South African Inst. Med. Res.*, December 1926.
- McCrae, J.: The Ash of Silicotic Lungs. *Pub. South African Inst. Med. Res.*, March 3rd, 1913.
- Middleton, E. L.: Etiology of Silicosis. *Tubercle*, London, 1919, 1:257-262.
- Pancoast, H. K. and Prendergrass, E. P.: Pneumoconioses (Monograph) 1926, Hoeber, N.Y.
- Permar, H. H.: The Function of the Endothelial Cell in Pathological Conditions especially in Tuberculosis. *Amer. Rev. Tuber.*, 1924, ix:6.
- Permar, H. H.: An Experimental Study of the Mononuclear Phagocytes of the Lung. *Jour. Med. Res.*, 1920, xlii:1.
- Permar, H. H.: The Development of the Mononuclear Phagocyte of the Lung. *Jour. Med. Res.*, 1920-21, xlii:2.
- Riddell, A. R.: A Case of Silicosis with Autopsy. *C.M.A.J.*, 1925, xv:839-841.
- Riddell, A. R. and Rothwell, H. E.: Some Clinical and Pathological Observations on Silicosis in Ontario. *Jour. Ind. Hyg.*, 1928, x:147.
- Sayers, R. R.: Effect of Silica Dust upon Lungs. *Amer. Jour. Pub. Health*, 1927, 17:208 and 348.
- Watkins-Pitchford, W.: Industrial Diseases of South Africa. *Med. Jour. of South Africa*, 1914, ix:196 and x:222.
- Watkins-Pitchford, W. and Moir, J.: On the Nature of Doubly Refracting Particles seen in Microscopic Sections of Silicotic Lungs and an Improved Method for Disclosing Siliceous Particles in such Sections. *Pub. of South African Inst. Med. Res.*, September 14th, 1916.
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Editorials

PARLIAMENT SHOULD BE INTERESTED

IT has long been a matter of concern to those of us who think nationally or who think we think nationally, which not infrequently amounts to the same thing, that, on the whole, health as a national problem receives much less than the attention it deserves in Canada. It would appear that it almost requires a war to make citizens think about the need for saving lives for the nation or of the importance of keeping the largest possible number of citizens healthy and fit. Possibly the reason is that only the obvious impresses most of us. When a country is attacked by another country the need for keeping a great force of healthy soldiers in the field compels the average person to think nationally on all problems making to that end and results in the elaboration of health conservation methods on a national scale. Obviously in the getting together of an army parochial considerations are forgotten when the achievement of a common aim is at stake. Vaccination and inoculation of troops during the great war were not confined to the soldiers of an individual province nor was the medical examination of recruits a measure which was modified to meet the views of individual provinces. A physically unfit soldier from Vancouver was just as dangerous to the welfare of the whole as was his fellow from Halifax—no more and no less. As a result all were treated alike.

But with the advent of peace the situation seems to alter and all sorts of considerations becloud the issue. For example, after the establishment of the Federal Department of Health under a Minister of Health at Ottawa, in spite of an immediate demonstration of the value of such a co-ordinating piece of machinery one immediately began to hear whispers of the need for conserving provincial rights—an argument commonly brought up by persons who were thinking more along political than along health lines—of rights rather than of responsibilities—and doubtless this was one of the reasons why health was seldom discussed on the floor of the House of Commons.

But in the long run proper considerations, where they are of sufficient weight, are likely to prevail and it would seem that education of the public has progressed to a stage where the House of Commons at least considers health worth talking about. Certainly one would think

so judging from the vigorous debates on the subject which were staged during the latter part of the last session of Parliament.

THE CANADIAN PUBLIC HEALTH JOURNAL has on more than one occasion called attention to the need for Dominion leadership in health matters and particularly to the necessity of active interest on the part of members of Parliament. The enormous cost of preventable illness and death in Canada has been brought to public notice repeatedly. The relationship of the problem to the future of Canada should be patent to anyone who thinks. The means of correction lie in the development of measures the success of which depends upon the interest which the legislators of the country take. A notable example is the country health unit scheme—a plan involving financial and administrative co-operation on the part of the Dominion, the provinces and municipalities. This scheme cannot be carried through to fruition unless the members of both Dominion and provincial parliaments can be induced to study not only this scheme but the whole problem of national health.

At the last session of the Dominion House health matters were discussed seriously for the first time since the establishment of the Federal Department. THE CANADIAN PUBLIC HEALTH JOURNAL is, of course, not interested in the political phases of the question nor in the responsibilities of any of the various political groups. But it is perhaps not inopportune to express the hope here and now that health as a problem of Dominion-wide concern has not been discussed for the last time on the floor of the Dominion House—but that indeed such matters may be considered of paramount importance by all statesmen of the future.

THE CANADIAN JOURNAL OF RESEARCH

A SPLENDID contribution has been made by the National Research Council of Canada in providing for Canada a journal for the publication of research studies. There has been felt, particularly during the past few years, the need for such a medium to permit of the prompt publication of the many scientific papers of our Canadian research workers in the universities, the National Research Council and other institutions. Canadian contributions to the scientific journals of the British Isles and to foreign journals have been generously received but these journals are already overcrowded. In the announcement of the new journal, Dr. H. M. Tory, President, National Research Council of Canada, while stating that the Journal is intended primarily for the publication of the results of work carried out under the auspices of the Council, announces that papers from research workers not connected with the Council will be published and that in its future development the Canadian Journal of Research can be depended upon to keep pace with the progress of scientific and industrial research throughout Canada. The new Journal is heartily welcomed.

LABORATORY SECTION

G. B. REED, Ph.D., AND A. L. McNABB, B.V.Sc.

ISOLATION AND CULTIVATION OF TUBERCLE BACILLI

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THE term "tubercle bacillus" includes only those acid-fast micro-organisms which are capable of producing tuberculosis, namely, the human, bovine and avian types.

Two methods are available of obtaining primary cultures of tubercle bacilli—the "direct" and "indirect".

The "direct" method consists in transferring uncontaminated, or treated contaminated material suspected of harboring the tubercle bacillus directly to suitable culture media.

The "indirect" method consists in recovering the tubercle bacillus through guinea pig inoculation. Uncontaminated, or treated contaminated material for study is inoculated subcutaneously and interperitoneally into guinea-pigs. The animals are allowed to live for six weeks, at the end of which time they are killed and autopsied under aseptic precautions. The tissues best suitable for culture are the lymph glands and spleen. The liver is seldom used for culture, the lungs never, as this source gives the greatest number of contaminations. The bit of tissue for culture is macerated with a pair of coarse sterile forceps, and with a stiff platinum loop smeared upon the surface of the medium to be employed. In order to prevent loss of strains, 8 or 10 tubes of medium are usually seeded on each occasion.

ISOLATION FROM CONTAMINATED SOURCES

Among the various reagents used in isolating tubercle bacilli from contaminated sources, antiformin, sodium hydroxide, sulphuric, hydrochloric and other acids have played a prominent part. The acid method of treatment appears to be superior to the other two methods.

Sulphuric and Hydrochloric Acid Methods (Loewenstein)

Equal parts of material for examination and 6 per cent sulphuric acid, or 3 per cent hydrochloric acid, are well mixed, and incubated for fifteen to thirty minutes at 38°C. The mixture is then centrifuged, the supernatant fluid decanted. Sterile saline is then added to the sediment which is well shaken and again centrifuged. This procedure is carried out three times. The sediment is then cultured directly upon suitable medium, or guinea-pigs are inoculated.

CULTIVATION

The tubercle bacillus is a parasite and grows best at body temperature. Variations in temperature will inhibit its growth, or destroy the organism. A well regulated incubator is therefore essential for the successful cultivation of this organism. The tubercle

bacillus grows very slowly. Colonies become visible to the naked eye in from 10 to 21 days. Sometimes, however, their appearance may be delayed. In order to obtain reliable results the following precautions must be observed:

The medium used must be properly sterilized and arrangements made to prevent evaporation. The surface of solid media should not be too moist. Non-absorbent cotton plugs, half dipped in melted paraffin will prevent evaporation and drying of the medium.

Where broth is used for cultivation the incubator should be kept moist by placing a vessel of water in it, which should be replenished from time to time in order to keep the air saturated with moisture.

Innumerable culture media have been suggested and tried in the cultivation of the *Bacillus tuberculosis*, but in our experience the following have given the best results:

Modified Dorset's Egg Medium
(Plain)

Sterilize eggs by allowing them to stand in 70 per cent alcohol for one hour. Break eggs into sterile flask, mix thoroughly and add beef infusion broth (free from peptone and sodium chloride, adjusted to pH. 7.4) in the proportion of two parts of egg to one part of broth. Mix well and pour about 5 cc. of medium into heavy wall culture tubes 6 x 1.

The tubes are then slanted in an inspissator, heated to 85°C. until coagulated, then for one hour on two successive days at 75°C.

Modified Dorset's Egg Medium with Glycerol

This medium is prepared in the same manner, with the addition of 5 per cent glycerol.

Gentian Violet Egg Medium
(Petroff)

This medium utilizes the well-known principle established by Churchman of the inhibitory properties of gentian violet dye upon many bacteria. This dye does not interfere with the growth of the tubercle bacillus. The medium is prepared as follows:

Meat Juice. 500 gm. of lean beef or veal are infused in 500 cc. of 15 per cent solution of glycerol in water in a refrigerator. After twenty-four hours, the bulk of the meat is separated by squeezing it through gauze, and the meat juice is collected into a sterile flask.

Eggs. The prepared eggs are broken into another sterile flask, well mixed and filtered through sterile gauze. One part of meat juice is added to two parts of egg, by volume.

Gentian Violet. A 1 per cent alcoholic solution of gentian violet is added to make a final proportion 1 to 10,000: e.g. 5 cc. to 500 cc.

The three ingredients are well mixed, filtered through sterile gauze, tubed and inspissated as above described.

Crystal Violet Potato Medium
(Corper)

Potato medium has a place in the cultivation of the tubercle bacillus. Recently, Corper devised a modified potato medium, which, when used in

conjunction with the sulphuric acid method of treating contaminated material, not only gives excellent results in obtaining primary cultures, but also does away with the necessity of guinea-pig inoculation.

Large clean potatoes free from surface defects are cut into cylinders about 3 inches in length and 5/8 inch in diameter, using for this purpose a cork borer. They are then halved longitudinally. As soon as they are cut, these potato cylinders are soaked in 1 per cent solution of sodium carbonate containing crystal violet (the stain added just prior to use, since prolonged contact with the sodium carbonate leads to discoloration) in concentration of 1:75,000 or 0.0013 per cent. After soaking from one to two hours, they are gently wiped with a clean towel to free them from excess of fluid and are introduced into sterile culture tubes containing 1½ cc. of 5 per cent glycerin bouillon, cotton plugged and sterilized in the autoclave at 15 pounds pressure for at least thirty minutes.

Glycerin Broth

The solid media described are suitable for isolation of primary cultures, and maintenance of stock cultures, but for experimental work and the preparation of tuberculin and extracts, where large masses of bacteria are required, glycerin broth is best.

To 500 gm. of minced lean beef or veal, 1,000 cc. of distilled water are added, and allowed to stand in the ice box for twenty-four hours. The

bulk of the meat is then separated by straining it through gauze. 10 gm. of peptone dissolved in 50 cc. of water, and 5 gm. of sodium chloride are then added. The infusion is then placed in a large flask and autoclaved at 15 pounds pressure for 20 minutes. While still hot, it is strained through filter paper. After cooling, the broth is adjusted to pH. 7.6, filtered, and 3 to 5 per cent glycerin added. The broth is then distributed into flasks or bottles, and sterilized once in the autoclave, at 10 pounds pressure, or fractionally in the Arnold sterilizer for one hour on three successive days.

The cultivation of the bovine tubercle bacillus deserves special comment.

The organism grows with the utmost difficulty. Growth does not appear until the end of the third week; usually its appearance is even later. Glycerin enhances the growth of the human type of the tubercle bacillus, but definitely inhibits the growth of the bovine tubercle bacillus. In our experience, modified Dorset's egg medium without glycerin gives the best results in isolating primary cultures.

References

- Baldwin, Petroff and Gardner. "Tuberculosis".
- Corper, H. J., and Nao Uysi. Jour Lab. and Clin. Med. vol. xiii, p. 469.
- Park and Williams, Text book of Bacteriology.
- Wang, C. Y. Jour. Path. and Bact. vol. xxi, p. 14.

PUBLIC HEALTH NURSING

RUBY M. SIMPSON, REG.N., AND FLORENCE H. M. EMORY, REG.N.

SCHOOL NURSING*

NOW that medical inspection of school-children, or, as it might be more correctly termed, health supervision of school-children, has been carried on for a number of years, we are reaching the point where we feel that an attempt to evaluate results is warranted.

When medical inspection of school-children was first established, its main purpose was the control of contagion; later was added the physical examination for the detection of remediable defects; while these two objectives are still prominent, a third and a most important has evolved, that of health promotion by means of education in healthy living.

We are reminded that public health has in its development passed through three eras. The first, beginning about one hundred years ago and lasting thirty or forty years, was the era of suppression of disease and was based on the theory that illness was caused by filth. This might be termed the age of sanitation. Following this was a period of disease-prevention, when greater efforts were made to control the environment and regulate the movements of individuals when they affected the public health. The third era has only just begun. It is an era not only of the suppression of disease through sanitation and of disease-prevention, but includes the education of individuals on personal hygiene and

rules of right living and in health promotion. In the present-day conception of public health the school-health service occupies a most prominent and important place. Through its specially trained health-workers the school-health service is able to bring to the children, the teachers, the parents, and the community expert information in the three fields necessary for public health—namely, sanitation, preventive measures, and personal hygiene and health promotion.

Can we truly say that health supervision of school-children is showing results, and is accomplishing those things which it set out to do in the prevention of contagion—the detection and correction of physical defects and education in healthful living? Measuring the results of health-promoting activities is difficult, but perhaps a few figures from the report on the Vancouver City schools, as they afford the largest group and as a system of health supervision has been established for a number of years, might be considered. The records show a steady decrease in the number of children found with physical defects of various kinds. For example, in the last few years, malnutrition has shown a decrease of 10 per cent; enlarged tonsils, 25 per cent; defective vision, 25 per cent; and defective teeth, 33 per cent. What is making the difference? We think that the

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answer can be found in the growing realization on the part of parents, teachers, school officials, and the general public, through health education, of the importance of knowing and applying the principles of sanitation to home and school environment, of the use of modern methods for prevention of disease, and to the education of individuals in personal hygiene. It is resulting in the saving of thousands of dollars to the ratepayers through saving of school-time, not only by preventing loss of school-time through preventable illnesses, but also by the increased ability of the children, through improved health conditions, to take greater advantage of the facilities provided. It is a well-known fact that children suffering from various physical defects constitute a large percentage of the "repeaters" in schools. In addition to this is the time saved by the prevention of the spread of contagious diseases by the early detection and isolation of infected children, which can only be done by trained health-workers. By this means others are protected from infection and illness prevented which might cause not only a loss of school-time during the active course of the disease, but also be followed by after-effects resulting in poor health and lowered efficiency in later years. A year ago certain regulations in connection with the control of infectious diseases were issued by the Provincial Board of Health, which are applicable only in communities in which an adequate school-health service is maintained. After operating under these regulations for three and one-half months, it was found that in the Van-

couver City schools 60,000 school-days at an approximate cost of \$18,000 had been saved. At the same time results proved conclusively that a maximum amount of protection had been given the pupils in the schools.

Through the activities of school-health workers, many harmful environmental conditions in school, such as improper lighting and ventilation, unsanitary and inadequate lavatory and toilet accommodation, and other unhealthy conditions, have been brought to the attention of the authorities and remedied. Special classes for handicapped children, such as open-air classes for delicate children, sight-saving classes for those with impaired vision, remedial classes for the correction of postural defects and deformities, special instruction and care for undernourished children, and dental clinics, have been established, all contributing to the improvement of child-health.

The importance of healthy children to the community and to the nation has been too often demonstrated to be doubted, and no effort is too great which will bring about this objective. The promotion of health is work for the community, for parents, teachers, and the children themselves, and for co-ordinating their work and stimulating their efforts the public health nurse, with the school as the centre from which her efforts radiate is essential. School-health work is a part of the great modern public health movement; and what is public health? We cannot do better than quote the definition given by Dr. C. E. A. Winslow, Professor of Public Health in the Yale School of Medicine, who says:

"Public health is the science and the art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of dis-

ease, and the development of the social machinery which will ensure to every individual a standard of living adequate for the maintenance of health; organizing these benefits in such a fashion as to enable every citizen to realize his birthright of health and longevity."

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EPIDEMIOLOGY AND VITAL STATISTICS

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THE TUBERCULOSIS SITUATION

THE necessity for much wider knowledge of the spread of tuberculosis, of the influence of such factors as race, environment, previous infection, condition, various physiological phases of life, etc., in other words, wider knowledge of the epidemiology of tuberculosis, was emphasized by Eugene L. Opie, Director of the Phipps Institute, Philadelphia, in the presidential address* to the National Tuberculosis Association. The knowledge that the disease is transmissible—as was demonstrated over sixty years ago—and ability to identify the causative organism are important factors, but quite insufficient in the control of tuberculosis. As Dr. Opie says: "After the discovery of the tubercle bacillus the procedures apparently needed to control the spread of tuberculosis seemed very simple indeed. Search for those who suffered with the disease and prevention of direct and indirect transfer of infectious material seemed to offer little difficulty. By these means much has been ac-

complished, but it has gradually been learned that causation of tuberculosis is modified by factors that increase the difficulties of control.

"The relatively simple conception of tuberculous infection accepted immediately after Koch's discovery is thus being displaced by one that is less readily understood; indeed many of the factors involved are still obscure. The fate of those infected in infancy and childhood depends upon conditions that are only partially known. It is by no means easy to unravel the consequences and characters of an infection that on the one hand confers resistance and on the other hand is itself a source of danger.

"Hence in the attempt to control tuberculosis we must concern ourselves not only with its transmission from the sick to the well, but with the existence of widespread concealed infections of varying grades of intensity, which in many instances under unfavorable conditions will become manifest disease. A survey of high-

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school children in Philadelphia just completed has shown that at least two in every hundred presumably healthy school children between the ages of 12 and 18 years have grave pulmonary tuberculosis recognizable by symptoms and characteristic physical signs or by roentgenological examination.

"Diminishing mortality from tuberculosis has to some extent produced the impression that control of the disease is assured. Inferences from the diminishing death-rate will do much harm if they suggest the relaxation of effort. We should keep in mind some trite figures. One hundred thousand persons die from tuberculosis in this country every year and approximately one million suffer from the disease. Bearing in mind that this toll of disease and death occurs in large part in early adult life tuberculosis may still be regarded as the greatest scourge of the human race.

"The menace of this widespread concealed infection, much of it just below the level of our vision, is obvious. Existing economic conditions are unfavorable to the development of tuberculosis, which is pre-eminent-ly a disease of poverty. Experience of the World War suggests that mortality from tuberculosis may rise with astonishing rapidity should these conditions be reversed. Dublin points out that the death-rate from tuberculosis in German cities, which was only 157 per 100,000 in 1913, rose in 1918 to 287. Similar increases occurred elsewhere; in Warsaw 840 of every 100,000 died from the disease in 1917, and in the city of Belgrade the rate rose as the result of military occupa-

tion and want of food to the "horrifying figure" of 1400. It is noteworthy, as Dublin states, that active tuberculosis was especially prevalent among children. With the establishment of normal conditions of industry, feeding and housing, the death-rate fell to that which prevailed before the War. It can scarcely be doubted that this sudden increase of fatal tuberculosis was in large part due to the transformation of advanced latent infection into active fatal disease under the influence of malnutrition and other conditions imposed by war.

"Knowledge of the occurrence of tuberculous infection in the community and of the conditions that favor or retard its spread is the basis of all effective efforts to control the disease."

This eminent authority cited certain specific problems, the solution of which he says is essential to the effective control of the disease. These problems are stated as follows:

"We know how many people die from tuberculosis but we have no accurate information about the number who suffer with the disease. The Framingham demonstration furnished interesting information and introduced numerous controversies, which are still unsettled. Every community, rural and urban, should know how many of its members have open tuberculosis and are scattering tubercle bacilli, how many have manifest disease but no tubercle bacilli in the sputum, and, equally important, how many children and adults have grave latent infections that threaten active disease and are a potential source of transmission.

"It is widely known that mortality from tuberculosis increases rapidly during adolescence and that in each decade during the last fifty years it has been much greater in young girls than in boys, yet we have no accurate information concerning the age and sex incidence of tuberculous infection separated into the groups just enumerated or of the conditions that influence susceptibility at different ages.

"Open-air schools for the prophylactic care of tuberculosis, summer camps and preventoria have been established on a vast scale throughout the country, yet we have in operation no machinery to select those children who will be benefited by admission to these institutions.

"The early recognition of pulmonary tuberculosis is enthusiastically advocated, yet we do not know how frequently it is possible and there is wide difference of opinion concerning the methods that are most successful.

"The prevalence of tuberculosis in the negro race, often in an acutely fatal form, is one of the gravest problems of public health in this country. We do not know whether the race is innately susceptible to the disease, or suffers from it as the result of economic conditions, or escapes spontaneous protective inoculation in early life more frequently than the white race. Without this knowledge intelligently devised procedures in their behalf are scarcely possible. Means for the solution of these problems are at our disposal.

"We have made little attempt to learn why tuberculosis is prevalent

among the American Indians. They have been allowed to solve their own tuberculosis problem and have made ghastly progress to this end."

After thus outlining the problem and the logical steps in its solution, Dr. Opie made a plea for an epidemiological section in the Association, where the technical aspects of the epidemiology of tuberculosis could be discussed from the standpoint of preventive medicine. He concludes an admirable address with the following paragraph:

"On this twenty-fifth anniversary we may regard with great satisfaction the achievements of the past, but at the same time, in my belief, we should not encourage the optimistic suggestion that tuberculosis is under control. It is an insidious disease, as yet imperfectly understood. Efforts to control it are restricted by inadequate knowledge concerning its occurrence and mode of spread. Health is purchasable—if we know what to buy."

POLIOMYELITIS IN ONTARIO

From August 3rd to September 14th there have been 236 cases of poliomyelitis reported in Ontario. The reported cases have been distributed as follows:—Ottawa City, 100; Ottawa Valley, 31; South and Western Ontario, 16; Huron and Bruce counties, 13; Niagara Peninsula, 19; Toronto and vicinity, 17; Middle Ontario, 13; Eastern Ontario, 4; Northern Ontario, 4; Western Ontario (west of Great Lakes), 5.

**REPORTED CASES OF CERTAIN COMMUNICABLE DISEASES IN CANADA*
BY PROVINCES—AUGUST, 1929**

Disease	Nova Scotia	New Brunswick	Quebec	Ontario	Mani- toba	Saskat- chewan	Alberta	British Columbia
Diphtheria....	2	11	116	189	21	42	34	27
Scarlet Fever..	22	15	162	145	10	29	59	20
Measles.....	1	6	54	403	26	61	55	89
Whooping Cough.....	8	—	269	486	16	181	31	15
German Measles.....	—	—	8	2	†	1	3	2
Mumps.....	—	—	11	116	11	19	24	31
Smallpox.....	2	—	3	17	—	3	4	3
Cerebrospinal Meningitis..	3	—	5	8	—	—	2	—
Anterior Poliomyelitis	2	1	26	104	5	3	3	6
Typhoid Fever	1	25	87	102	4	10	8	12

*Data furnished by the Dominion Bureau of Statistics, Ottawa.

†Not reportable.

PUBLIC HEALTH ENGINEERING

T. J. LAFRENIÈRE, C.E. AND A. E. BERRY, C.E., PH.D.

ALGAE CONTROL BY CHLORINATION

THE unpleasant taste and odor of many municipal and private water supplies is due in some cases to the development of plankton life or algae. At times the growth is so luxuriant that small reservoirs must be emptied and the algae dug out every few days. As algae develop in most abundance under the influence of sunlight, one method of treatment has been to cover the reservoir, but this in many cases is impractical, if not impossible. Copper sulphate treatment, by dusting it on the surface, washing the sides of the wells or reservoirs after removal of the algae, or drawing it in a bag through the water, or by solution feeding has been used to a large extent. This requires frequent application and very careful supervision. In the case of many smaller reservoirs, lacking adequate supervision, the method has not been entirely satisfactory. The costs of repeated emp-

tying, extra pumping, greater reserve necessary, etc., are really not economical in cases where the need is great.

The State Board of Health of Texas, which has many of these algae-infected water supplies under its care, undertook an investigation of the possibility of using some other medium as an efficient and economical algicide. The report of this investigation is published in the *Journal of the American Water Works Association*, Volume 17, Number 4, April, 1927, by Chester Cohen, Sanitary Engineer, State Board of Health, Austin, Texas. The most effective treatment found was chlorination. As many plants are already equipped with a chlorinating apparatus, the cost of the small extra amount of chlorine required is practically negligible. In plants not so equipped, the installation is not expensive.

Adequate data are given of the

findings obtained under various conditions. The amount necessary to control the algae under conditions quoted was found to be from .75 to 1.5 p.p.m. depending on quality of water, time, etc. In one place the additional cost was \$6.00 per month, while the cost for washing the tanks and treating with copper sulphate had been \$88.50 per month.

From the data the following conclusions are drawn:

"1. Since chlorine can be employed as a combined bactericide and algicide, the expense of installation and operation of additional chlorination units is not excessive.

2. The residual chlorine which is necessarily maintained to insure sterilization becomes effective toward inhibiting algae growth.

3. The simplicity and economy of chlorine application and the minimum of labor and experience involved recommend its use.

4. Since chlorine does not remain in the treated water no danger exists in cases of over-dosing.

5. From the field and laboratory data chlorine appears to possess merits that make it worthy of greater consideration in algae control work."

In a later paper, presented before the Water Purification Division of the American Water Works Association in June, 1928, L. B. Mangun, Chemist in charge of Water Purification, Water Department, Kansas City, described the conditions encountered in a large uncovered reservoir where blue vitriol treatment had failed to control algae development. By chlorinating, the algae growth was completely controlled — at only a very

small fraction of the cost of covering the reservoir, a project which was under consideration when the chlorination was commenced but which has been unhesitatingly abandoned.

The discussion on this subject brought out the superiority of chlorination under such conditions. This means of algae control has undoubtedly passed the experimental stage.

USE OF DEEP WELLS AS A SOURCE OF MUNICIPAL WATER SUPPLY

The extensive use which is being made in Ontario in recent years of the deep well as a source of municipal water supply is an indication of its increasing popularity under suitable conditions. The very favorable attitude at present on the part of the public with respect to the installation of modern conveniences has resulted in a programme of water installations for many of the very small communities. Most of these are inland, and no suitable surface water supply has been available, especially without careful treatment. Under these conditions where deep wells can be secured they are looked upon with much favour.

Deep wells possess both advantages and disadvantages. Their advantages include the following:—

(a) Treatment for safety is not generally required.

(b) The water is cool, and usually palatable.

(c) Less expert operation of the plant is required than where elaborate treatment works are in use.

(d) The cost is usually quite favorable as compared with other systems.

The disadvantages may be listed as:—

(a) Sufficient supply is not always available, and the securing of water is somewhat of a gamble.

(b) No large visible quantity of water is available for fire fighting purposes.

(c) These wells are only applicable to certain areas where the mineralization does not affect the palatability.

The extensive use of these wells recently may, in some measure, be attributed to the activity of the well drilling companies, and the pressure applied by the Provincial Department of Health for the installation of waterworks systems. There are drilling companies in business now, whose contract comprises a guarantee to furnish a definite quantity of water. In this way the uncertainty of the programme is placed on the company, rather than the municipality. This is a particularly favorable method for the small community, whose officials

are so subject to criticism when any attempt results in failure to secure the desired quantity of water.

Recent installations of deep well systems of the gravel-wall type of construction have been made in Ontario at the following places: Brampton, Glencoe, Blind River, Midland, Courtright, Kitchener, Cochrane. Wells are under construction or contemplated at Tilbury, Lucknow, Deseronto. Several others are expected to follow in the near future.

The possibility of securing a municipal water supply at a reasonable cost for the small inland municipality will be welcomed by many who have been deterred from such a programme in the past. There are still some supplies in use for fire purposes only and these need replacement at the earliest date. They are never safe. Health officers may now recommend such a course as a means of removing the danger and uncertainty of the polluted private wells found in so many municipalities.

NATIONAL VOLUNTARY HEALTH AGENCIES

RUBY E. HAMILTON, Reg.N.

THE JUNIOR RED CROSS CONFERENCE IN GENEVA

JUST preceding the biennial meeting of the World Federation of Education Associations, there was held in Geneva this summer a remarkable Junior Red Cross Conference, to which were sent delegates from 37 countries of the world. The countries represented were:—Great Britain, the United States, Australia, New Zealand, South Africa, India, the Argen-

tine, Chili, Costa Rica, Cuba, Ecuador, Mexico, Switzerland, Austria, Hungary, Germany, Jugo-Slavia, Czechoslovakia, Poland, Greece, Roumania, Bulgaria, Denmark, Norway, Esthonia, Lithuania, Latvia, Dantzic, Italy, France, Spain, Portugal, Belgium, Holland, Siam, Japan and Canada.

This meeting constituted in deed, if

not in word, a veritable League of Nations, a league devoted to a common purpose, that of "the promotion of health, the prevention of disease and the mitigation of suffering among the children of the world." It is interesting to know that 41 countries of the world are participating in this league of youth, and there is now a membership of over 11,000,000 children and young people enrolled as members, who are enthusiastically putting into effect their obligations of practising the rules of health and the precepts of mercy.

It would be difficult to give in a few words the concrete results of such a conference, for it is impossible, apart from the fundamental purposes which are common to all countries, to draft regulations or attempt to put into effect definite methods which would be suitable to all countries. However, it came as a surprise to most of the delegates to find how similar the problems of Junior Red Cross are all over the world. Perhaps the most distinctive note in the Conference was that of optimism, for, in spite of apparently insurmountable difficulties, Junior Red Cross is expanding with great rapidity not only in the North American continent, but in the most conservative countries of the world. It is commending itself alike to leaders of education and to leaders of public health in all the civilized countries of the world.

The meetings of the Conference were held in the Athénée, in the very room where the Geneva Conference of 1864 was held, at which the great idea of the Red Cross was evolved. The representatives of the 1864 con-

ference who planned a series of conventions around the symbol of the Red Cross as a guarantee of mercy and relief on the field of battle, little thought that 65 years later another group of people would sit in the same room to discuss the best means of extending this idea for the promotion of health among the young people of the entire world. That well known emblem of mercy which millions of young people now wear, carries still the idea of service to those in need of help, and it also inspires them to practise with enthusiasm those laws of health adopted by their organization.

One of the most interesting events of the Conference was the reception of the delegates by the International Committee of the Red Cross, a committee which has continued its work since the Geneva conference in 1864, and which functioned so remarkably during the Great War. This committee may be regarded as the guardians of the Red Cross, and its members have regarded the peace-time developments of the League of Red Cross Societies with a watchful eye. Even the most enthusiastic exponents of the peace-time idea must admit that this vigilance has been necessary, for the peace-time work has moved very rapidly, and in this very rapidity danger lurked. So the warmth of the reception given by members of the International Committee at their headquarters at 1, Promenade du Pin, at what one might call "The Home of the Red Cross," was, in itself, a great commendation for the Junior Red Cross movement.

A compliment was paid to the Canadian Junior Red Cross when the

Director for Canada was asked to sign the historic visitors' register first, an acknowledgement of the fact that Canada was the first country to record a Junior Red Cross organization.

Several well known international organizations sent representatives to the Conference, and a representative of the League of Nations Secretariat attended all the sessions.

NEWS AND COMMENTS

P. A. T. SNEATH, M.D., D.P.H.

The Opium and Narcotic Drug Act, 1929

A NEW Act amending and consolidating the previous Act has recently come into force, copies of which, with a circular letter from the Chief of the Narcotic Division of the Department of Pensions and National Health, have been forwarded to the members of the professions concerned.

Under this Act, it would appear to be illegal to furnish opium-containing drugs such as *Pil. Plumbi cum Opii* for emergency use to individuals such as missionaries and others who may be going to places where medical assistance is unobtainable. An incident of this sort having arisen recently, a communication was addressed to the Narcotic Division of the Department of Pensions and National Health for their ruling. They requested that under such circumstances, the information should be forwarded to the Department, from which, "if the circumstances so warrant, the necessary authority will be readily granted". This information may be of value to physicians who may be called upon to prescribe such drugs for people who are not at the time suffering from any condition warranting the use of drugs covered by the Schedule.

A New Vaccination Order

UNDER the Vaccination Act, the Minister of Health of Great Britain has issued a new order, which comes into force October 1st, 1929, dealing with the first four recommendations of the Committee on Vaccination presided over by Sir Humphrey Rolleston.

Public vaccinators shall henceforth vaccinate or re-vaccinate in one insertion only, unless the person requests more when the number of insertions may be increased up to four. Further, the objective in successful vaccination is to obtain the desired protection with the minimum of injury to the tissues, in consequence of which, the vaccinator is instructed that under no circumstances are the insertions to be cross-scarified or cross-hatched.

Recommendation number II of the Committee stressed the desirability of primary vaccination being performed in infancy between 2 and 6 months of age as provided in the existing Act and re-vaccination being offered as a child enters school (6-7 years) and again on leaving (14-16 years). A new paragraph has been added to the form of notice giving effect to this and authority is given to the public vaccinators to re-vaccinate any person who applies without reference to the

period elapsing since the last vaccination.

In compliance with the fourth recommendation of the Committee, alterations have been made in the form of notice forwarded by registrars of births and deaths informing parents and guardians that it is the duty of the public vaccinator who performs a vaccination to attend and prescribe treatment if such is needed in his opinion as a result of the vaccination, and that without charge to the parent or guardian.

Attention is drawn in the circular to the report made by the Committee on "post-vaccinal nervous disease", of its serious effect both on the administration of the Act, and its medical aspects, noting also that such disease is extremely rare after vaccination in early infancy and after re-vaccination, and recommending, therefore, the desirability of securing successful vaccination in early infancy. As long as smallpox in Great Britain continues to retain its present mild character, it is the opinion of the Minister that it is not generally expedient to press for the primary vaccination of persons of school or adolescent ages unless they have been in personal contact with a case of smallpox or in any other way directly exposed to the disease.

Old Age Pensions Act, Ontario, 1929.

NOVEMBER 1st, 1929, marks the date when The Old Age Pensions Act becomes effective in Ontario, signalling the agreement between this province and the federal Minister of Labour, who administers the Old Age Pensions Act of the Do-

minion, which was promulgated in 1927.

The Act in Ontario operates through the Old Age Pensions Commission under the Minister of Labour and Health. Local pensions boards, to whom applications are forwarded, have been appointed by the municipal or county authorities, and by the Lieutenant-Governor-in-Council in the case of provisional judicial districts. These local pensions boards are empowered to decide on the eligibility of each applicant, which decision is, however, subject to appeal before the Commission at Toronto.

Funds are provided, in the case of the fifty per cent payable by the province under the Dominion Act, by payment on the part of every municipal corporation named by the Commission as a contributor, of twenty per cent of the total of each pension assessable to such.

In this province the Act in no way interferes with the liabilities of the sons or daughters under The Parents' Maintenance Act of Ontario; in fact, proceedings may be taken by a local board or the Commission under this Act in the case of a person applying for or in receipt of a pension.

The Province of Ontario now assumes the obligations under the Dominion Act in common with Alberta, British Columbia, Manitoba, Saskatchewan, and the Yukon Territory, whereby benefits are payable in case of former residents of Ontario now resident in the foregoing provinces and under the reverse circumstances. There remain, therefore, Quebec and the Maritime Provinces which are not yet signatory to the Dominion Act.

Poliomyelitis

THE number of cases of poliomyelitis reported in Canada for the month ending August 31st, is given by the Department of Pensions and National Health as 164 with the following distribution:—Nova Scotia, 2; New Brunswick, 1; Prince Edward Island, 0; Quebec, 23; Ontario (five weeks), 96; Manitoba, 15; Saskatchewan, 15; Alberta, 3; and British Columbia, 9.

Sanitary Inspectors' Association

AT the 16th annual convention of the Sanitary Inspectors' Association of Canada at Moose Jaw, Saskatchewan, Ernest W. J. Hague of Winnipeg, Manitoba, was re-elected as president; Alexander White of Montreal, Quebec, as vice-president for the Province of Quebec, and Hugh McIntyre of Kirkland Lake, Ontario, as vice-president for the Province of Ontario. The next convention is to be held in Winnipeg in 1930.

Quebec.

WITH the assistance of the Rockefeller Foundation, the Provincial Bureau of Health has established a training school for county-unit work, the Beauce County Health Unit being utilized for this purpose. Dr. Deschenes continues in charge of the Beauce unit, and Dr. R. Foley, who has recently completed his public health work at Johns Hopkins University, has been placed in charge of the training school. The personnel appointed to the units under establishment in Temiscamingue, Megantic,

and L'Islet-Kamousaska are now under training at this school.

The personnel having completed their training at the Beauce Training School, the 10th county health unit, of this province, in Chicoutimi, has now commenced operations. Being in close proximity to the Lac-St.-Jean unit, the first unit established under this scheme, the district health officer, Dr. J. Constantin, has the technical and scientific supervision over the conduct of these two units, each of which is directed by its respective medical officers.

At present there are ten county health units fully equipped and operating over thirteen counties. Three more units will be established before the end of the present calendar year, at Temiscamingue, Megantic and L'Islet-Kamousaska. Dr. C. H. Dumais, the district health officer at Temiscouta, will be in charge of both the Temiscouta and L'Islet-Kamousaska county units. With the establishment of these units, there will be seventeen counties of the province served by this county-unit scheme.

Dr. Deschenes, of the Beauce Unit, is at present touring the States of Mississippi and Tennessee under the Rockefeller Foundation for the purpose of studying the operation of their respective training schools.

Dr. J. A. Ferrell, Associate Director of the International Health Division of the Rockefeller Foundation, and Dr. Louis I. Dublin, one of the scientific directors of the same organi-

zation, have been visiting several of the county health units in this province, and conferring with the Provincial Secretary, the Hon. Mr. David, and Dr. Alphonse Lessard, Director of the Provincial Bureau of Health.

In an interview with one of the Quebec dailies, Dr. Ferrell, who has been identified with the international health activities of the Foundation since its inception, states that the Quebec plan for the financing and establishment of county health units is, in certain respects, unique, in that provision is made for the preliminary intensive training of personnel over two to three months, the appraisal of this personnel at the training schools and the advanced training of the unit directors at the leading schools of public health. Dr. Ferrell further stated that the plan in this province has been wisely conceived, but that the scheme requires continued financial support on the part of the central and local authorities before the health needs of the province can be adequately met.

An epidemic of typhoid fever occurred at Gatineau Point, near Hull, in June and to date has involved some 135 cases, fifty of which are of a severe nature. One death has so far occurred from this cause. It is stated that this epidemic has been occasioned by a fault in the town water main.

Seven cases of poliomyelitis occurred at Murray Bay during the month of August. Upon the instruction of the Provincial Bureau of Health the local schools were not opened. Convalescent serum was forwarded from Montreal.

Ontario.

HAROLD AMOSS, B.A., B.Paed., formerly of the Normal School, Hamilton, has been appointed to the vacancy created by the retirement of Dr. S. B. Sinclair as Inspector of Auxiliary Classes for the Province.

Dr. R. E. S. Challener has been appointed to the Moore Park District with the Toronto Department of Health.

Dr. W. E. Blatz, Associate Professor of Psychology at the University of Toronto, and a member of the Toronto Research Division of the Canadian National Committee for Mental Hygiene, delivered a course of lectures on mental hygiene at the first session of the summer school at the University of Chicago. Dr. Blatz commenced a lecture tour on September 23rd, which includes Vancouver, Courtenay, Calgary, Edmonton, Saskatoon, Regina, Brandon and Winnipeg.

E. D. McPhee, M.A., Associate Professor of Psychology at the University of Toronto, delivered a course of lectures on "The Mental Hygiene of the School Child" at the summer school of the State University of Iowa.

D. L. MacLean, M.B., B.Sc. (Med.), has been appointed Research Assistant in Physiological Hygiene at the School of Hygiene, University of Toronto.

Manitoba.

DR. A. T. MATHERS, Director of the Winnipeg Psychopathic Hospital and Provincial Psychiatrist, is taking post-graduate work under

Professor Hans Maier at Zurich, Switzerland.

Saskatchewan

THE Sanitary Inspectors' Association of Canada held their annual convention in the city of Moosejaw, September 4th, 5th and 6th.

The Government of the Province of Saskatchewan at the last session approved of the Plumbing and Drainage Regulations, which were gazetted July 20th, last. Certain features of these will bear comment:

Section 74 provides authority compelling the owner of any building which abuts on a water main and common sewer, within sixty days after receiving written notice from the medical officer of health, to install at his own expense, such plumbing as may be considered necessary and to cause such fixtures to be connected.

Section 75 provides for the installation of approved toilet accommodation in stores, offices, gasoline filling stations and any other place where the medical officer of health or the Minister may direct. This may seem rather arbitrary, but under certain circumstances is necessary.

Section 93—the penal clause—states the extent of the fine and further directs the magistrate to impose a court order compelling the defaulting party to comply with the notice of the health authority. These clauses, therefore, permit of no evasion; in addition to the penalty the work must be completed.

Our correspondent notes that the legislation appears to be most satisfactory, but awaits the "acid test" of the courts.

Dr. F. Monroe, the member for Moosomin, has been appointed Minister of Public Health, by Premier Anderson in the new Saskatchewan Cabinet. The Hon. Dr. Monroe was born at Moose Creek, Ontario, November 13th, 1881, received his education at Cornwall Collegiate Institute, and Queens' University, and has been practising medicine at Welwyn, Saskatchewan, for some years.

British Columbia

EPIDEMIOLOGIST APPOINTED FOR BRITISH COLUMBIA.

DR. Alexander R. Chisholm, a Dalhousie graduate, has been appointed, (August, 1929) Epidemiologist to the British Columbia Provincial Board of Health, under Dr. H. E. Young, Provincial Health Officer.

After an intern year at the Vancouver General Hospital, Dr. Chisholm was granted a Rockefeller International Health Board travelling scholarship. Following a period with the Rockefeller Training School in Alabama, he became county health officer and a year later, was offered the position of assistant state epidemiologist, but continued as county health officer to accumulate further knowledge of administration and organizing. He was nearly two years in this work in Oklahoma, and comes to British Columbia very highly recommended by all the various bodies with which he has been associated. The rapid expansion of the Provincial Board of Health activities, to meet the insistent public health demands of the British Columbia public, called for such an appointment as the next immediate step in advance.

BOOK REVIEWS

D. T. FRASER, B.A., M.B., D.P.H. and R. R. McCLENAHAN, B.A., M.B., D.P.H.

Collected Studies from the Bureau of Laboratories, Department of Health, City of New York—

By Dr. William H. Park, Director. Volume 10, 1920-26. Published by the Department of Health City of New York.

This volume of studies from Dr. Park's laboratory brings together all the papers published by members of the staff from 1920 to 1926. It is a volume of 583 pages containing a wealth of valuable research contributions in the field of preventive medicine. Included in this volume are the studies of Dr. Park, Dr. Zingher and others in the development of toxin-antitoxin, observations on the Schick reactions, and other studies relating to diphtheria. The various papers have been published in medical and research journals and are, of course, available in libraries. The bringing together of these valuable papers into one publication will be greatly appreciated by all those interested in public health laboratory work and their accessibility will add to their value.

R.D.D.

Selected Readings in Pathology—

Edited by Esmond R. Long, Professor of Pathology, University of Chicago. Charles C. Thomas, Publisher, Springfield, Ill., 1929. 25 plate illustrations, 301 pages. Price \$4.00.

The landmarks of medical history to the average man very often assume a condition that may be likened unto the prophet's vision of the "Valley of

Dry Bones"; a man's name, the dates of his birth and death, associated with the general idea that his name is "hitched" to some symptomatic complex or some pathologic state that he is reputed to have been the first to describe. Offhand, "Corrigan's pulse" and "Bright's disease" come to our mind as examples. In this volume, containing excerpts from the classics of pathology arranged in chronological order from Hippocrates to Virchow, we feel that Professor Long has not only caused the dry bones to come together and clothed them, but has also put new life into them.

In the preface the editor states that "the aim of this book is simply to furnish, in a frankly discontinuous way, a more intimate acquaintance with a few of the greater masters of the subject by allowing them to tell their own stories". We feel he has accomplished this most admirably. Each selection is preceded by a concise foreword by the editor, and due acknowledgement is made as to the origin of each translation. With the exception of the selection from the work of Carl Rokitsansky, dealing with his humoral pathology of "crases" and "dyscrases", the material presented in this volume is positively enjoyable and can well be recommended to students of medicine, (in the broader sense) both graduate and undergraduate. It should also be noted that the publisher has well maintained in every respect the standard set by the editor.

P. A. T. Sneath.

CURRENT HEALTH LITERATURE

D. T. FRASER, B.A., M.B., D.P.H.

The Role of the Vaccination Dressing in the Production of Postvaccinal Tetanus.

Among 116 investigated cases of tetanus following vaccination, it was found that all had developed following primary takes which had been covered for all or part of their active course by some type of dressing strapped to the vaccination site. The types of dressing employed on these 116 cases were as follows: celluloid shields, 53; gauze, 40; bunion pads, 17; gauze and shield, 5; adhesive bandage, 1.

The source of the infection, in spite of thorough investigation of all the cases, is unknown except for two outbreaks, one due to infected bone-point scarifiers and the other to infected bunion pads used for dressings. Apart from the point scarifiers, the Hygienic Laboratory has been consistently unable to find tetanus organisms in any commercial virus.

It is not reasonable to suppose that tetanus bacilli only gain entrance to primary "takes" which have been covered. Yet these conditions prevailed in all the 116 cases. It seems, therefore, in order that tetanus may develop, that in addition to the presence of *B. tetani*, the "take" must be primary and covered with a dressing. In support of this it has been shown that animals do not develop tetanus after vaccination with a known tetanus-contaminated virus, except when the wound is covered by a shield or dressing.

The fact that most shields and dressings do not exclude air would seem to rule out anaerobiosis as an essential factor.

In contrast to an openly treated vaccination which is ventilated and kept dry by the movements of air and clothing, thus favouring a firm vesicle, the dressed "take" retains perspiration, tends to congestion by reason of the pressure on the capillaries and lymphatics, and generally leads to the formation of a warm moist wound. These conditions are favourable for the growth of proteolytic organisms which in turn produce more maceration and the deep foul "takes" which have generally been found to precede post-vaccination tetanus. It is believed, therefore, that an accumulation of broken-down material retained by the dressing at the vaccination site, is the essential condition without which post-vaccination tetanus will not develop under natural conditions.

"A small, superficial implantation of the virus and the abandonment of dressings at the vaccination site will eliminate tetanus as a complication of vaccination. If a dressing is deemed advisable for any reason, the objectionable feature of the *fixed* covering can be avoided by pinning a few layers of gauze to the inside of a loose-fitting sleeve."

This is a most convincing article on the danger of vaccination dressings.

Armstrong, Public Health Reports, Vol. 44, No. 13, August 2, 1929.

